An Economic Impact Analysis of Mineral Beneficiation in KwaZulu-Natal's Iron and Steel and Aluminium Value Chain

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Abstract:

This paper examines mineral beneficiation within the aluminium and iron & steel industries in Kwazulu-Natal and the associated value chains. Multiplier analysis is used in conjunction with the provincial social accounting matrix to determine the knock on effects of increased beneficiation, exploring the relevant impact of backward linkages. The multipliers created by both direct and indirect stimulation in the downstream industries are examined and the impacts of beneficiation on economic and welfare indicators are assessed. The key findings of the study are that the net effect on regional production is more than double the value of the initial stimulation for each of the considered sectors in the value chain. Moreover, job creation becomes evident when demand increases and that much of this employment go to the previously disadvantaged. There are however relevant drawbacks in terms of constrained electricity supply and significant leakages created by imports

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1) INTRODUCTION

An emphasis is placed on mineral beneficiation as a feature of State[1] policy and the growing competition for resources between different sectors of the economy, as well as highlighting their contribution to regional growth. This makes the resource intensive processing of metals as well as their relative contribution to regional production, growth and employment a natural focus of concern. This paper will centre particularly around beneficiation of the iron & steel and aluminium sectors in Kwazulu-Natal (KZN), i.e. the manufacturing of the relevant metals in accordance with the Standard Industrial Classification (SIC) codes (Statistics South Africa, 2012), and assessing it as an arena for growth in the province. The analysis makes use of a social accounting matrix (SAM) framework and applies it to KZN data as well as assessing whether the underlying assumptions for SAM analysis hold in the province. Multiplier analysis is thereafter utilised to assess the impact of the value chain on welfare and production multipliers in Kwazulu-Natal. The welfare measures consist of income, employment as well as job creation per racial group and skill level. This is of importance since manufacturing is a prominent sector in the province. Additionally there are significant demographic issues facing the population. Improvements in welfare indicators arising from increased beneficiation can assist with these issues, which will subsequently be investigated.

Kwazulu-Natal makes the second largest provincial contribution to the national gross domestic product (GDP) and has the second largest population in South Africa (Statistics South Africa, 2014a). From 2006 onwards, KZN has contributed 16% or more to the national GDP (Gauteng provided about 33%) and its real regional gross domestic product (GDPR) growth rate has been in line with or above the country's (see Table 1).

Table 1: SA versus KZN GDP growth rates

Year	**South Africa real GDP growth rate**	**KZN real GDPR growth rate**
2005	5,4	5,7
2006	5.6	5.4
2007	5.4	6.2
2008	3.2	4
2009	-1.5	-1.3
2010	3	3.4
2011	3,2	3.5

[1] a synopsis is presented in a DMR brief on Beneficiation Economics see http://www.dmr.gov.za/beneficiation-economics.html

2012	2,2	2.6
2013	2,2	2.1

(Statistics South Africa, 2014a)

However from 2008 to 2013, the contribution of KZN's provincial GDP to the national GDP has declined by 0.6%, from 16.6% in 2008 to 16% in 2013 (Statistics South Africa, 2014a, p.11). It is therefore imperative to assess the areas that are shrinking and growing and what development opportunities are present which can be stimulated by appropriate policies.

Table 2 presents the slowing of production growth of the manufacturing sector in KZN, as well as of declined GDPR growth, post the 2008-2009 global economic slowdowns. In 2010 the manufacturing sector contributed 21% to the provincial GDP, a proportion which had remained relatively unchanged in 2013 (Statistics South Africa, 2014a, p.58).

Table 2: KZN real industry growth rates in constant 2010 prices

Industry	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Agriculture, forestry and fishing	-6.2	0.8	5.3	21.6	-3.4	0.7	9.2	1.2	1,8
Mining and quarrying	-6.3	-3.3	2.5	-6.5	-2.7	7.2	-0.9	2.`1	4.3
Manufacturing	*6.2*	*6*	*5.4*	*2,2*	*-10.4*	*6.3*	*2.8*	*1.9*	*0.9*
Electricity, gas and water	6.5	3.7	3.3	-4.5	-4.3	1.2	1	0.2	-0.1
Construction	13.7	7.8	15.1	10.1	9.5	1.7	0.5	2.3	3.1
Wholesale, retail and motor trade; catering and accommodation	6.5	6.4	6.1	1.5	0.2	4.5	4.7	3.4	1.5
Transport, storage and communication	5.9	5.2	8.3	3.7	0.1	2.2	2.8	2.5	2.3
Finance, real estate and business services	10.6	7.7	7.3	5.8	1.6	1.2	4.1	2	3.2
Personal services	3.3	5.4	5.4	3.6	-0.1	0.6	2.7	2.3	2
General government services	4.5	3	4.9	5.5	3.3	3.4	3.7	4	3.1
All industries at basic prices	5.8	5.3	6.4	4.2	-1.2	3.2	3.5	2.5	2.2
Taxes less subsidies on products	4.5	6.4	4.6	2.4	-2.3	5.9	3.7	3	1.5
GDPR at market prices	**5.7**	**5.4**	**6.2**	**4**	**-1.3**	**3.4**	**3.5**	**2.6**	**2.1**

(Statistics South Africa, 2014a)

Although it contributes strongly to national GDP, a growth stimulus in KZN has clear political appeal. In part this is because the province has a large tranche of the national electorate who face a variety of labour and population based issues. It remains strongly affected by unemployment, high child mortality rates, threats to life expectancy through HIV AIDS and TB, and is also the country's second most densely populated region (Development Bank of Southern Africa, 2013a). African's are in the majority, making up 85.2% of KZN's population; Indians and Asians make up 8.3% of the total; and the White population 5%. The Coloured group makes up 1.5% of the

total population (Statistics South Africa, 2014c). There is additionally high inequality in the region as in the rest of the country (AFRA, 2006).

The manufacturing sector currently employs 16.2% of the working force, almost equal to its contribution to provincial GDPR as noted by Trade and Investment Kwazulu-Natal (2013) and thus growing this sector could absorb additional labour (Development Bank of Southern Africa, 2013a). It is to be noted that this industry is marginally more capital intensive with a capital to labour ratio of 0.54:0.46, as found in the SAM and which is explored in the 'Findings' section. Despite this, growth creation in this sector could assist with alleviating unemployment in the region. Moreover it employs almost equal percentages of youth and older members of the labour force, consequently if this sector is stimulated it could have positive impacts on the high youth unemployment rate in the region (Development Bank of Southern Africa, 2013a).

This paper proceeds with an examination of the iron & steel and aluminium industry in section 2, a methodology in section 3. The multiplier model's assumptions in section 4, multiplier analysis in section 5, followed by the findings in section 6 and ends with a conclusion in section 7.

2) IRON & STEEL AND ALUMINIUM INDUSTRY

This paper will assess the economic and welfare impact of increasing beneficiation by the aluminium and iron and steel sectors in Kwazulu-Natal, both of which are categorised within the basic metal products sector in terms of the SIC codes classification (Statistics South Africa, 2012). Division 24 specifies the components of the basic metals sector as follows:

> **Division 24 Manufacture of basic metals**
>
> This division includes the activities of smelting and/or refining ferrous and non-ferrous metals from ore, pig or scrap, using electrometallurgic and other process metallurgic techniques. This division also includes the manufacture of metal alloys and super-alloys by introducing other chemical elements to pure metals. The output of smelting and refining, usually in ingot form, is used in rolling, drawing and extruding operations to make products such as plate, sheet, strip, bars, rods, wire, tubes, pipes and hollow profiles, and in molten form to make castings and other basic metal products.

(Statistics South Africa, 2012)

We will proceed to investigate the precious and non-ferrous metals industry in KZN, followed by the iron and steel industry. We shall examine the basic metal industry's production processes,

the tonnage of output produced as well as the companies involved in the value chain within Kwazulu-Natal.

In South Africa, precious metal manufacturing consists of gold and platinum, primary or final product manufacturing (Department of Mineral Resources, 2011). In KZN, there is no production or processing of platinum and only minimal beneficiation of gold (The Minerals to Metals Initiative, 2013, p.36). Stonewall Resources is the sole gold beneficiation plant, it only beneficiates to first level, producing 0.16 tonnes of gold per year (Stonewall Resources, 2013). Non-ferrous metals consequently comprise the bulk of KZN's precious and non-ferrous metal manufacturing sector.

Aluminium and titanium slag dominate KZN's processed minerals industry (Department of Mineral Resources, 2011), however, titanium slag is a titanium mineral concentrate and does not fit with the SIC code classification of a non-ferrous metal manufacturing product (Statistics South Africa, 2012; Minerals to Metals Initiative, 2013). South Africa does not have any deposits of bauxite and imports its raw alumina from Australia. The ore is then smelted into aluminium; an extremely power intensive process, locally (Deloitte, 2011). The energy intensity as well as the implications for the industries concerned is evaluated in section 6.i.

The initial production stage in the South African aluminium industry involves the production of primary (from bauxite) and secondary (from scrap) aluminium, by smelting. Bauxite is smelted into primary aluminium in KZN, at the Hillside and Bayside smelters in Richards Bay, owned by BHP Billiton. These plants were developed to take advantage of the then cheap and ample electricity supplied by Eskom (BHP Billiton, 2013). Hillside and Bayside produce 761 000 tonnes per year and production is classified under the manufacturing of basic metals, since it involves smelting an ore, which is in accordance with the SIC industry group classification (BHP Billiton, 2013; Statistics South Africa, 2012).

Most of the downstream beneficiation utilises the aluminium from the Bayside smelter, as two thirds of the Hillside output is exported. Post-2009, Bayside had to reduce its production of aluminium after an agreement with the power supplier Eskom, which faces increasingly constrained electricity supply (BHP Billiton, 2013). Many of the downstream industries that historically relied on Bayside's aluminium have subsequently had to import aluminium.

BHP Billiton's smelters in Richards Bay supply to the secondary smelters and semi-fabricators (AFSA, 2015b). The distinction between secondary smelters and semi-fabricators is not always evident since many semi-fabricators house remelt facilities (The Green House and The Minerals

to Metals Initiative, 2014a). The main input to secondary smelters is scrap. Added to this, is a measure of primary aluminium, to maintain a certain level of purity (The Green House and The Minerals to Metals Initiative, 2014a). The secondary smelters produce casting alloys as well as metal industry alloys in powder and ingot form (AFSA, 2015b). Located in KZN is 'Non-Ferrous Metal Works' (NFM), a secondary aluminium producer. While the secondary aluminium market produces 30,000 tonnes per year nationally, KZN production is trivially small (AFSA, 2015a). The price of scrap is expensive due to global influences. This has resulted in an uncompetitive local casting and downstream industry, although the local quality is of a world-class standard (AFSA, 2015b). ASC Ltd, which is a division of Pressure Die Casting (PDC), HW Schmidt Industrials and Pfisterer Ltd are foundries in KZN. These foundries produce cast-metal components, but their share of the total foundry market in South Africa is relatively small (The Green House and The Minerals to Metals Initiative, 2014a).

Semi-fabrication involves producing extrusions, sheet, foil, and plate both for export, as well as for local manufacturers and fabricators (AFSA, 2015b). Semi-fabrication is undertaken by Hulamin who produce 215,000 tonnes of semi-fabricated products annually in KZN (Hulamin, 2013). Hulamin is capable of supplying most of South Africa's demand for rolled products (AFSA, 2015b). Fabrication consists of adding value to the semi-fabricated products and casting alloys. BEHR and Pro Aluminium and Glass are fabricators in KZN who produce engine components, electrical cables, cold-drink cans and gate frames (The Green House and The Minerals to Metals Initiative, 2014a). Fabricated products are utilised in various industries such as transport, electrical, construction, automotive and packaging (AFSA, 2015a). For this reason, summing the pertinent figures, the total non-ferrous basic metal manufactured products available, excluding the final fabrication stage, is 976,000 tonnes.

The South African export market of aluminium products is not however cost competitive. Partially due to the strong Rand relative to other aluminium exporting nations, as well as a failure to produce the demanded volumes (AFSA, 2015b). The quality is, however, compatible with international standards (AFSA, 2015b).

We now turn to assess the iron and steel industry in KZN. Kwazulu-Natal does contain some iron ore deposits, but none of this ore is currently being mined (The Green House and The Minerals to Metals Initiative, 2014b). The process of crude steel production in South Arica involves initially smelting the iron ore into pig iron in blast furnaces (Kumba, 2011). Thereafter, the conversion to steel takes place in basic oxygen furnaces, the product being formed into

standard steel products in rolling mills (Kumba, 2011). Reprocessing of steel scrap using electric arc furnaces is also in place, however this utilises large amounts of electricity whilst utilising less iron ore (Kumba, 2011). 555 000 tonnes of pig iron per year is produced as a by-product of mineral sands production at Richard's Bay Minerals in KZN and is at first level beneficiation (Richard's Bay Minerals, 2014). Moreover, Tronox (2012) indicate that it produces 121 000 tonnes of pig iron per year. The principal steel producer in KZN is that of ArcelorMittal's Newcastle Works and 1 800 000 tonnes of primary steel is cast into long products per year at Newcastle, utilising the blast furnace method (ArcelorMittal, 2013)

Semi-fabrication occurs when steel products are manufactured from primary steel via rolling and finishing (Kumba, 2011). Product examples are rails, joints, rounds, flats, angles, channels, reinforcing bars, coiled wire rod, sheet and plate. The primary steel producers are generally responsible for this stage (Kumba, 2011). Additionally, foundries produce cast products by melting scrap metal and ingots (The Green House and The Minerals to Metals Initiative, 2014b). The relevant foundries in KZN are Böhler Uddeholm Africa, Umgeni Iron Works (Pty) Ltd and PEFCO (The Green House and The Minerals to Metals Initiative, 2014b).

Fabricators in KZN produce an extensive range of the end merchandise from semi-fabricated and cast products. Safal Steel and Tugela Steel are involved in building and construction (Kumba, 2011; The Green House and The Minerals to Metals Initiative, 2014b). In addition, Bell Equipment and Toyota SA cover mining and automotive, while Grief SA and Metcan are concerned with packaging (Kumba, 2011; The Green House and The Minerals to Metals Initiative, 2014b).

The downstream steel sector is locally and regionally competitive. However exporting of finished goods on a large scale has not been evident due to a lack of cost competitiveness. This is because of high logistics costs and great distances from markets (Kumba, 2011).

These are the major iron and steel manufacturing plants in KZN, which totals 2 476 000 tonnes of basic iron and steel products per year. Basic precious metal production is merely 0.16 tonnes, whilst basic non-ferrous metal production was found to be 976 000 tonnes. Therefore, output is 976 000.16 tonnes for the basic precious and non-ferrous metal products industry. Out of the total basic metal products industry in KZN, 72% comprises of the basic iron and steel industry whilst 28% constitutes the aluminium industry at first level beneficiation.

3) METHODOLOGY

The aim of the remaining sections is to utilise a matrix representation of the KZN economy to assess the linkages and the impact on various economic and welfare indicators. Matrix representations of an economy are useful tools that capture the interrelated complex relationships between sectors, which play a role in the circular flow of money occurring in an economy. The origins of matrix representations of an economy are traceable back to the "Tableau Economique" by F.Quesnay in the 18th century. This table showed the relations between sales and purchases by various economic agents within the sectors of an economy (UN: Department of Economic and Social Affairs, 1999). A vital concept in matrix representations of an economy is that for every expenditure item by one sector, another sector earns it as income. This forms the double-accounting method for recording transactions in macroeconomics (Reinert and Roland-Holst, 1997).

Quesnay formulated the concept that these input-output tables are analogous to the production function of a relevant industrial sector which utilises fixed proportions of inputs in their manufacturing process (UN: Department of Economic and Social Affairs, 1999). Leontief further developed this matrix representation of an economy, by introducing the input-output model. Leontief added the final demand component for a sector's output but then simplified the table in so far that each industry could produce only one output (Rose and Miernyk, 1989). Richard Stone combined the input-output concept into the system of national accounts for the United States (UN: Department of Economic and Social Affairs, 1999). Pyatt and Thorbecke (1976), after that, introduced the SAM framework which has further been utilised in a number of studies across various fields to assess the impact of multiplier analysis.

From the aforementioned pioneering work, three key matrix representations of an economy emerge. These can be utilised when assessing the sectored linkages and their importance in an economy. The first matrix representation of the economy is the supply-use table, which depicts industry by-product accounts. The industry accounts portray the production procedure or 'supply', and the use-table depicts the production costs (inputs) and the income received by the industry accounts (European Commission, 2003). This is useful as it allows an industry to supply more than one product resulting in these supply-use tables being utilised as data sets, from which input-output tables are created (Blair and Miller, 2009).

The second matrix representation is an input-output table. The table displays the inter-industry linkages; how much one industry, demands from another. This allows an assessment of the importance of specific products, including the relevant proportional needs of the appropriate industries (Blair and Miller, 2009). These inter-linkages could be allocated as product-by-product linkages, or as an industry-by-industry linkage. The third is a social accounting matrix (SAM), and this captures the same inter-industry linkages as in the input-output table, but adds a further social dimension (Blair and Miller, 2009). The social dimension allows for the evaluation of several aspects. The impact industries have; on factors of production (capital and labour), enterprises and households, government, savings and investments, as well as on the rest of the world (exports and imports). The social dimension is important for highlighting people and social welfare in terms of the leakages and injections into an economy, as well as the broader impact that particular industry sectors have on the well-being of the population.

The SAM in South Africa is constructed using a variety of data sources. Major constituents are a Population Census, Household Expenditure Surveys, Labour Force Surveys, Geographic Information Systems (GIS) as well as Industrial and other sectoral censuses (DBSA, 2013b). Additionally, creating a provincial SAM requires further data sources, which consist of information gathered by provincial governments while performing their executive functions, as well as individual research projects conducted in a province (DBSA, 2013b).

When estimating a SAM, one needs to utilise the top-down or bottom-up approach. The top-down approach relies on the primary information provided in the national system of accounts and inputs this as the row and column totals in the SAM (Kavese, 2007). It then disaggregates these row and column sums further, to establish relevant inter-industry linkages. Alternatively, the bottom-up approach uses the principal data from which the national accounts were constructed. Additionally, conducting in-depth industry research and consulting other data sources, obtains a less mechanical construction of the SAM (Kavese, 2007). Furthermore, the RAS and Cross-Entropy approach are methods utilised to update and balance a SAM. The RAS technique is employed particularly when there is new information regarding the column and row totals, but no new information concerning the disaggregated input-output relations (Robinson et al., 2001). It updates the SAM by adjusting the row and column figures proportionally while maintaining the new row and column totals (Kavese, 2007). When balancing a SAM, where the method of solving the undetermined equations is being executed via setting up restrictions to find a unique outcome; the Cross-Entropy approach is useful. (Kavese, 2007; Robinson et al., 2001).

i) KZN SAM MODEL

The purpose of the following section is to utilise the KZN SAM in applying multiplier analysis to assess the net effects on relevant accounts and on the linkages present in the KZN economy. Multiplier analysis will be conducted in a backward linkage framework, in which exogenous demand for the appropriate column accounts is increased, and the effect on the input industries resulting from that, will be analysed. We proceed to describe the SAM and illustrate how multiplier analysis is conducted.

In the Kwazulu-Natal SAM, constructed by The Development Bank of Southern Africa (2013b), utilising the bottom-up approach, where the base year is 2006, there is a total of 202 accounts. There are 11 exogenous accounts and 191 endogenous accounts. The exogenous accounts are comprised of the national, provincial & local government expenditure accounts, the capital expenditure account by both the government and the corporate and household sector. The rest of South Africa and the rest of the world as exogenous accounts are further disaggregated into expenditure for goods and services, factor payments and transfers. The exogenous accounts are further classified as the exogenous demand accounts.

The 191 endogenous accounts contain 46 industries as well as 46 commodity accounts classified according to the Standard Industrial Classification (SIC) codes (Statistics South Africa, 2012). Factory gate pricing is applied to the activity accounts representing the domestic producing sectors in the economy (European Commission, 2003). The activity sector's output, the domestic supply, is purchased solely by the same industry grouping commodity account, as seen in the SAM in Table 12 and 15. The commodity accounts consist of the flow of goods and services in the economy and are all priced at consumer purchase prices (European Commission, 2003). The domestically consumed commodities price, for this reason, includes tariffs and sales tax, by that, indicating that all prices along each row are the same. This is the law of one price (Elsenburg, 2003). However, despite exports being in the same row, they are valued at export prices (Elsenburg, 2003). Commodities are acquired by final demand accounts, such as the government, households, rest of the world and the rest of South Africa accounts. Additionally, various commodities form inputs to production by the activities accounts. Breisinger et al. (2010, p.2) distinguishes between the two by saying: "Activities are the entities that produce goods and services, commodities are those goods and services produced by activities."

The endogenous accounts are further comprised of factor payments to labour. These are disaggregated into both colour and skill level. Additionally, four accounts of factor payments to capital owned by public enterprise, private business enterprise, combi-taxi enterprise and by

informal enterprise, which together with labour make up the factor account. In addition, there are both enterprises and households, which are endogenous accounts where the enterprise account comprises public enterprise, private business, combi-taxi, and informal enterprise. The household account is further broken up based on colour, as well as by income bracket for each colour group (into twelve income percentiles per colour group) as listed in Table 3. The grouping is in accordance with the findings of the 2005 household income and expenditure survey utilised in the 2005 National SAM (Statistics South Africa, 2010).

Table 3: Income Percentile groupings

Percentile	**Annual Household Expenditure (Rand)**
P1	R1–R7,769
P2	R7,770–R10,393
P3	R10,394–R14,564
P4	R14,565–R18,609
P5	R18,610– R23,278
P6	R23,279–R28,654
P7	R28,655–R36,755
P8	R36,756–R51,426
P9	R51,427–R79,152
P10	R79,153–R150,693
P11	R150,694–R237,544
P12	R237,545+

(Statistics South Africa, 2010)

The endogenous income accounts consist of national, provincial & local government income, capital account income for the government as well as by the corporate and household sector. In addition, the rest of South Africa's income, as spent by the Kwazulu-Natal accounts, are disaggregated as follows. Factor payments and transfers, goods and services and the balance on the current account, make up the endogenous income accounts. The final endogenous income accounts, consist of the following. Income stemming from expenditure by the KZN accounts, for the rest of the world's factor payments and transfers, goods and services, as well as the balance on the current account.

Table 4: Kwazulu-Natal SAM entries

		Expenditure Columns							
		Activities		**Commodities**		**Factors**	**Households**	**Exogenous Demand**	**Total**
		A1	**A2**	**C1**	**C2**	**F**	**H**	**E**	
Income Rows	**A1**			X1					X1
	A2				X2				X2
	C1	Z11	Z12				C1	E1	Z1
	C2	Z21	Z22				C2	E2	Z2
	F	V1	V2						V
	H					V1+V2			Y
	Endogenous Income			L1	L2		S		E
	Total	X1	X2	Z1	Z2	V	Y	E	

(Breisinger et al., 2010)

Table 4 presents the balanced SAM entries with the direct expenditure made by the column accounts and the direct income received by the row accounts. The entries in the matrix describe a physical flow of goods and services from the rows to the columns and a monetary flow from the columns to the rows (European Commission, 2003).

This is an illustration of two activities and two commodities for simplification, but is extendible to forty-six industries, as in the KZN SAM. Gross output or the domestic supply of the respective activity is given by X1 and X2 while the aggregate demand for the respective commodity is given by Z1 and Z2 (Breisinger et al., 2010). Gross factor (capital and labour) income is given by V, which is equivalent to household income Y, since the households are known to own the factors of production (Breisinger et al., 2010). Exogenous demand expenditure E, spent on commodities (by the government, capital, rest of South Africa and the rest of the world, i.e. exports) is equivalent to the endogenous income received by these accounts. Import payments by the commodity accounts are categorised in endogenous income, in the line item payments for goods and services to the rest of the world. The exogenous demand accounts create the final demand shock. However, the model retains the same accounts as in the exogenous accounts but on the income earning side as endogenous. This is in order to assess the relevant changes to these accounts, which the exogenous demand shock produces.

Appendix A, Table 11, depicts the summarised KZN SAM in 2006 millions of Rands. This depicts how much each column account demands from the row accounts, and in turn, how much income the row accounts earn from the column accounts. Importantly, we can determine how much the activity accounts require as inputs from the commodities as well as the demand by the good sold (commodities) for its own sector's production (activity) as an input. The negative values pertain to the government and capital accounts as well as to the residual figures. The negative figures in the government (local and central) column and the capital row accounts

is indicative of anti-saving and that budget deficits are present. Similarly, households are anti-saving and require borrowing to finance this. Further portrayal is indicated by the negative figure in the capital account column (both government and other sectors) and the capital account row. The rest of the world is financing the capital account deficit as depicted by the negative figure in the capital account column and the rest of the world row.

This summarised SAM is further disaggregated into the forty six activity and forty six commodity accounts in Appendix B, Tables 12 to 15. The tables display the expenditure conducted by the activity (commodity) column accounts, as well as the income received by the activity (commodity) row accounts, in which total expenditure is equivalent to total income, according to the double entry rule. This will be further analysed in Section 6: Findings.

The M Matrix in Table 5 is then derived by dividing each element, by its column total. This then represents the amount of the input in the row account utilised by the column in producing its output, in a fixed amount. It measures the static relationships between a sector's output and its inputs (Blair and Miller, 2009).

Table 5: The M Matrix

		Expenditure Columns							
		Activities		**Commodities**		**Factors**	**Households**	**Exogenous Demand**	**Total**
		A1	**A2**	**C1**	**C2**	**F**	**H**	**E**	
Income Rows	**A1**			X1/Z1 =a13					X1
	A2				X2/Z2 =a24				X2
	C1	Z11/X1 =a31	Z12/X2 =a32				C1/Y=a36	E1	Z1
	C2	Z21/X1 =a41	Z22/X2 =a42				C2/Y=a46	E2	Z2
	F	V1/X1 =a51	V2/X2 =a52						V
	H					(V1+V2)/V =a65			Y
	Endogenous Income			L1/Z1 =a73	L2/Z2 =a74		S/Y=a76		E
	Total	1	1	1	1	1	1	E	

Adapted from (Breisinger et al., 2010)

It is worthwhile noting that a31, a32, a41 and a42 are the technical coefficients, the input utilised as a percentage of total expenditure, whilst the value added accounts or payments made to the factors of production are a51 and a52. The share of domestic demand for the respective commodity is given by a13 and a24 while the share of total demand for imported commodities is given by a73 and a74. The proportion of the household's consumption expenditure is given by a36 and a46 while the share of savings from household income is a76. Additionally, the

coefficients in the M Matrix represent the first round increases in input required when there is an exogenous increase in demand for the output in the column accounts (Blair and Miller, 2009).

4) THE MULTIPLIER MODEL: ASSUMPTIONS

In this analysis, an unconstrained multiplier model is utilised which is accompanied by some assumptions worth assessing. Breisinger et al. (2010) indicates that the first assumption associated with the unconstrained multiplier model is that of fixed prices. Any positive demand shock will lead to increases in output rather than to an increase in prices. Secondly, it is required that for prices to remain fixed, an increase in demand must be met by an increase in supply, which implies that excess supply capacity is present. Thus, the supply curve is horizontal (Breisinger et al., 2010).

In 2004, the aluminium industry had a production capacity of 911,000 tonnes per annum. It comprised the sum of three potlines at the Bayside smelter with a total capacity of 313,000 tonnes, as well as the Hillside production capacity of 598,000 tonnes per annum (BHP Billiton, 2004). In 2005, the Bayside smelter was producing 166,000 tonnes while the Hillside smelter was producing 685,000 tonnes per year. This gave a total production of 851,000, which, for this reason, leaves room for excess capacity and thus the assumption holds for this analysis (BHP Billiton, 2005).

Additionally, when demand increases, a vital assumption is that the structure of the relations between the agents does not change (Breisinger et al., 2010). Thus, the ratio of inputs required for a given level of output must all increase by the fixed proportional amount with an exogenous shock. This is the specification of the Leontief production function, which uses intermediate inputs in fixed proportions. Then, a set quantity of respective inputs is utilised to produce a certain level of output (Blair and Miller, 2009). This implicitly states that technology establishes the ratio of intermediates in the production function, rather than the choice of manufacturers.

According to Lau and Tamura (1972), a Leontief production function is relevant for processing activities that operate under rigid technological circumstances. The iron & steel and aluminium industries in Kwazulu-Natal in fact have as we know, utilised the same production technology for a number of years. ArcelorMittal's annual financial reports for 2006, 2007 and 2013, indicate that the long steel products at the Newcastle plant employ the production technologies of one

blast furnace, three oxygen furnaces and four rolling mills. Each of these, in turn, require a particular set of inputs to operate (ArcelorMittal South Africa 2013; ArcelorMittal South Africa Limited 2007; Mittal Steel South Africa Limited 2006).

Additionally, the process for smelting alumina into aluminium has a set technological process that evolves slowly over time and requires fixed inputs in its production function. BHP Billiton (2004) describes this technological process in a presentation on the Bayside and Hillside Smelters at Richard's Bay. Hillside utilises the aluminium Pechiney AP30S technology and Bayside's Potroom 'A' makes use of pre-bake technology, and Potroom 'B' and 'C' make use of the Soderberg Paste technology (BHP Billiton, 2004). For this reason, we note that the inputs required by the basic aluminium industry are indeed determined by the technological process of production. The former has remained relatively consistent from the mid-2000's to the present, allowing for the assumption of a Leontief production function to hold.

Moreover, the Leontief production function is associated with a marginal rate of technical substitution between inputs of zero (Radetzki and Van Duyne, 1985). Førsund and Jansen (1983) suggest that ex-post substitution after capital investment has occurred, is seemingly small in relation to prior the investment occurring. Førsund and Jansen's (1983) study finds that the elasticity of substitution in the Norwegian aluminium sector between inputs is minuscule, centred about zero. In Kwazulu-Natal, we are aware that large-scale capital investment in the aluminium industry has indeed occurred historically and thus we are expectant that this industry is characterised by marginal rates of substitution centred about zero. The above implies that the production processes in 2006 are not structurally different from those in 2015.

Additionally, Hall (1972) specifies that the production function for the steel and pig iron manufacturing processes be of fixed proportions. This is where output can only be increased in the following climate. When the amount of each input required to process a given level of output is increased in the relevant proportion, i.e., the Leontief production function is characterising steel and pig iron production (Hall, 1972). The production process and methods utilised in KZN remain unchanged. These are characterised by 'fixed proportions', specified by Hall (1972, p.30) to produce pig iron via the blast furnace method, as well as producing steel via the basic oxygen furnace route. We can describe the iron & steel production processes as embodying the Leontief characterisation, thereby meeting the necessary assumptions. Førsund and Jansen (1983) suggest that ex-post substitution after capital investment has occurred, is seemingly small in relation to prior the investment occurring. Therefore the iron and steel value chain, in which capital

investment has occurred, is operating with fixed inputs in its production processes. This implies that the production processes in 2006 are not structurally different from those in 2015.

As of late, the aluminium sector in Richard's Bay has come under pressure, particularly due to the increasingly constrained electricity sector. The Bayside smelter had to close two of its potlines post-2008, reducing its capacity to 95,000 tonnes per annum from 313,000 tonnes per annum in 2004 (BHP Billiton 2004; BHP Billiton 2012). This SAM does not reflect the substantially diminished production post-2008 and its implications on employment as well as further linkages in the local economy.

5) MULTIPLIER ANALYSIS

Now that we have evaluated the assumptions necessary to apply multiplier analysis and have found that they do hold; we may proceed with the analysis. We utilise the symbols in the SAM, Table 4, setting the M Matrix row components equivalent to the SAM totals. Then writing out the M Matrix rows as linear equations (and multiplying through by -1). This is so that the exogenous accounts are on the right-hand side as in Blair and Miller (2009). We proceed with the backward linkage model in order to assess the net impacts on input accounts after the exogenous demand is increased.

$$X1 - a13.Z1 = 0 \quad (1)$$

$$X2 - a24.Z2 = 0 \quad (2)$$

$$Z1 - a31.X1 - a32.X2 - a36.Y = E1 \quad (3)$$

$$Z2 - a41.X1 - a42.X2 - a46.Y = E2 \quad (4)$$

$$V - a51.X1 - a52.X2 = 0 \quad (5)$$

$$Y - a65.V = 0 \quad (6)$$

$$E - a73.Z1 - a74.Z2 - a76.Y = 0 \quad (7)$$

Rearranging the above equations, as mentioned, to establish:

$$a13.Z1 = X1 \quad (8)$$

$$a24.Z2 = X2 \quad (9)$$

$$a31.X1 + a32.X2 + a36.Y + E1 = Z1 \quad (10)$$

$$a41.X1 + a42.X2 + a46.Y + E2 = Z2 \quad (11)$$

$$a51.X1 + a52.X2 = V \quad (12)$$

$$a65.V = Y \quad (13)$$

$$a73.Z1 + a74.Z2 + a76.Y = E \quad (14)$$

Inserting the equations into a matrix, ordered from equations (8) to (14):

$$\underbrace{\begin{bmatrix} 0 & 0 & a13 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & a24 & 0 & 0 & 0 \\ a31 & a32 & 0 & 0 & 0 & a36 & 0 \\ a41 & a42 & 0 & 0 & 0 & a46 & 0 \\ a51 & a52 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & a65 & 0 & 0 \\ 0 & 0 & a73 & a74 & 0 & a76 & 0 \end{bmatrix}}_{\boldsymbol{M}} \underbrace{\begin{bmatrix} X1 \\ X2 \\ Z1 \\ Z2 \\ V \\ Y \\ E \end{bmatrix}}_{\boldsymbol{X}} + \underbrace{\begin{bmatrix} 0 \\ 0 \\ E1 \\ E2 \\ 0 \\ 0 \\ 0 \end{bmatrix}}_{\boldsymbol{F}} = \underbrace{\begin{bmatrix} X1 \\ X2 \\ Z1 \\ Z2 \\ V \\ Y \\ E \end{bmatrix}}_{\boldsymbol{X}} \quad (15)$$

Solving the above equation, utilising matrix algebra, for X, in matrix format:

$$\boldsymbol{MX + F = X} \quad (16)$$

$$\boldsymbol{F = X - MX} \quad (17)$$

$$\boldsymbol{F = (I - M)X} \quad (18)$$

$$\boldsymbol{(I - M)^{-1}F = X} \quad (19)$$

This is equivalent to the following matrix:

$$\underbrace{\begin{bmatrix} 1 & 0 & -a13 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -a24 & 0 & 0 & 0 \\ -a31 & -a32 & 1 & 0 & 0 & -a36 & 0 \\ -a41 & -a42 & 0 & 1 & 0 & -a46 & 0 \\ -a51 & -a52 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & -a65 & 1 & 0 \\ 0 & 0 & -a73 & -a74 & 0 & -a76 & 1 \end{bmatrix}^{-1}}_{\boldsymbol{(I - M)^{-1}}} \underbrace{\begin{bmatrix} 0 \\ 0 \\ E1 \\ E2 \\ 0 \\ 0 \\ 0 \end{bmatrix}}_{\boldsymbol{F}} = \underbrace{\begin{bmatrix} X1 \\ X2 \\ Z1 \\ Z2 \\ V \\ Y \\ E \end{bmatrix}}_{\boldsymbol{X}} \quad (20)$$

This formula indicates the increase in total final demand X (after multiple rounds of linkages), post an exogenous increase in initial demand F. This takes into account the direct and indirect

linkages via $(\mathbf{I} - \mathbf{M})^{-1}$ in which the linkages are incorporated in the M Matrix (Breisinger et al., 2010).

6) FINDINGS

It is important to distinguish which industries and commodities will be focused on in the SAM, since this analysis examines beneficiation of the iron and steel and aluminium (basic metal products) industry. It is vital to assess the downstream industries in KZN which make use of iron and steel and aluminium as inputs. To evaluate, in terms of sectors which can be focused on, in order to grow demand for the ferrous and non-ferrous metals and to create linkages via employment, income and output growth regionally. Downstream industries found to be most important by the Greenhouse and the Metals to Minerals Initiative (2013) task team, as well as highlighted significant sectors in the SAM, Table 14 Appendix B, are shown in Table 6 and Table 7.

Table 6: Iron and steel - significant downstream industries

Industry	**SAM grouping**
Packaging –steel cans	Other fabricated metal products
Construction –steel roofing/steel structures	Structural metal products
Automotive	Transport equipment manufacturing
Machinery and equipment which performs independently through mechanical or thermal mechanisms	Machinery and equipment

Table 7: Aluminium - significant downstream industries

Industry	**SAM grouping**
Automotive - car body parts	Transport equipment manufacturing
Railway infrastructure	Other fabricated metal products
Infrastructure-large renewable green energy projects	Structural metal products
Aluminium cables	Other fabricated metal products

Packaging - beverage can production	Other fabricated metal products
Machinery and equipment which performs independently through mechanical or thermal mechanisms	Machinery and equipment

These highlighted downstream KZN industries demand large quantities of the basic metals products as inputs into their production processes; therefore they are a part of the basic metal product value chain, as seen in Table 14. The structural metal products activity division demands R603.2m of basic metal products, which forms 50% of their total expenditure. The other fabricated metal products industry requires R1,967m of basic metal products, 51% of their total spend. In addition, the machinery and equipment industry requires R6, 221m of basic metal products, 42% of their total expenditure. Transport equipment manufacturing requires R861.5m of basic metal products comprising 2.3% of their spending. We note the magnitude of basic metal products as inputs for these sectors in KZN, excepting transport equipment manufacturing. This renders is less important in the basic metal product value chain. Growth in the automotive manufacturing industry, while also ensuring there is a shift towards absorbing local aluminium, iron and steel products, will as a result, stimulate basic metal products. For this reason, increasing output in the beneficiation stages will fuel production in the iron and steel as well as in the aluminium sector. The above-listed industries and their categorisations in the SAM will be assessed in the subsequent section, when examining the net linkage effects regionally. We will now turn to evaluate the welfare and economic importance of the basic metals product sector, as well as the highlighted downstream industries forming the basic metal products value chain.

Appendix B, Tables 12 to 15 presents the disaggregated SAM from where we determine the welfare importance of the basic metals value chain. The aluminium and iron and steel (basic metal products) activities, i.e. the production industry employ labour and capital as inputs, as seen in Table 14. Looking at salaries: Africans earn R2,488.8m (2.3% of Africa's total wage income). Coloured's receive R128.9m (2.9% of Coloured's total wages). Indians and Asians are paid R942.7m (3.1% of total income) while Whites are paid R824.5m (3.1% of total wage income). Additionally, we note that the capital employed is worth R5,159.3m. The total value of labour employed is R4,385m resulting in a ratio of labour to capital, of 0.46:0.54. This indicates that the industry is marginally more capital intensive, however, it still primarily affects the welfare of the population.

In terms of the direct employment created at the first stage beneficiation level in the basic metal product industry, 1600 individuals were employed at ArcelorMittal's Newcastle works in 2012 (ArcelorMittal, 2012). Moreover, 2,988 persons are directly employed in the primary aluminium sector in KZN in 2013 (BHP Billiton, 2013).

The downstream industries absorb labour, and are similarly affected by growth in the value chain. Inspecting Table 8, we note several things. The structural metal products, other fabricated metal products, machinery and equipment, as well as the manufacturing of transport equipment, do not contribute as much to employment as in the basic metal products sector. The totals paid to labour and to capital for each industry is depicted in Table 8. Interestingly, in each industry the capital to labour ratio is constant at 0.54:0.46. Indicative that the aluminium, iron and steel downstream industries are marginally more capital intensive, but that labour remains critical as a factor of production.

Table 8: Value of labour employed in the downstream industries

Industry	**Value of Labour employed (wage income)**	**Capital employed**
Structural Metal Products	R169m	R199m
Other Fabricated Metal Products	R532m	R625.4m
Machinery and Equipment	R1,630m	R1,918.1m
Manufacturing of Transport Equipment	R1,983m	R2,334m

(Development Bank of South Africa, 2013b)

It is useful to establish which skill sectors in terms of value (wage and quantity) of the labour force, are employed predominantly by the basic metal products sector. In Table 9, we note that the majority of the skill level employed, in terms of wage and quantity, in the primary beneficiation stage is that of legislators, senior officials and managers, as well as professionals, which fulfil skilled positions. Craft and related tradesmen, as well as plant and machine operators, are additionally central to the value of the labour force employed in the basic metal products sector and are in a lower skilled category.

Table 9: Total of labour employed by skill level

Labour skill level	**Value of labour employed**	**% of total labour employed**
Legislators, senior officials and managers	730.86	0.17
Professionals	621.19	0.14
Technical & associate professionals	338.02	0.08
Clerks	294.41	0.07
Service workers, shop & market sales workers	266.17	0.06
Skilled agric. and fishery workers	144.21	0.03
Craft and related traders workers	609.18	0.14
Plant and machine operators & assemblers	490.13	0.11
Elementary occupations	432.46	0.1
Domestic workers	458.26	0.1

(Development Bank of South Africa, 2013b)

Export earnings for the iron, steel and aluminium sector amounts to R15,998m (30% of total earnings) while the transport equipment sector earns R5,052m (6% of total earnings), as seen in Table 13. The structural metal sector earns R66m from exports (2.5% of total earnings) and the other fabricated metal products' export earnings are R94m (1.1% of total earnings). Machinery and equipment's export earnings amounts to R1401 (5.2%). We note the importance of the export earnings of iron, steel, and aluminium at first level beneficiation. This is the inputs necessary in the remaining downstream industries leaving the country, which is what we want to avoid by increasing beneficiation. We also see that there is room to grow the export earnings, in the rest of the value chain, via appropriate cost cutting policy measures, since the aluminium and iron and steel downstream industries struggle to be globally competitive, as previously indicated (AFSA, 2015b; Kumba, 2011). It is worthwhile to examine the value in each industry which is 'exported' to the rest of South Africa, as in Table 13. These are considerable amounts in the value chain's earnings.

Table 12 depicts the import dependence of the aluminium and iron and steel value chain. The basic metal products sector spends 7% of their total expenditure on imported commodities. The structural metal products, other fabricated metal products, machinery and equipment as well as the manufacturing of transport equipment sectors have import payments worth 9%, 22%, 31% and 19% of their total spending respectively. Import payments for the downstream sectors are larger than the export payments received.

Each commodity account is taxed, and import tariffs are paid to the government, as captured in Table 12, Appendix B. Specifically; we note that basic metal products, structural metal products, other fabricated products, machinery and equipment as well as the manufacturing of transport equipment sectors pay R570m, R67m, R224m, R475m and R2,492m respectively as tax to the national government. In addition, the relevant sectors receive substantial subsidies from local, provincial and national governments as depicted in Appendix B, Table 11. The basic metal products industry receives R39m of subsidies, which is the smallest amongst the downstream value chain, with the majority being funded provincially. If we had to add the implicit subsidy that the aluminium sector receives, in the form of ad-hoc electricity charges, we would discover a greater subsidy figure received by the basic metal products sector. The most generous subsidies are paid to the machinery and equipment and structural metal products sectors, of R1, 568m and R687m respectively. The provincial government capitalises the bulk in the machinery and equipment sector while the local government funds the majority in the structural metal products sector. We note that the structural metal products, other fabricated metals and the machinery and equipment sectors receive net subsidies from the government, while the remaining sectors pay net taxes.

We now turn to the implementation of multiplier analysis in which we utilise equations (19) and (20), extended to represent the underlying KZN matrices. In order words, we exert an exogenous demand shock for the specific sectors in the value chain and via the multiplier process captured in the M matrix we can then determine how the relevant sectors are stimulated by the shock. The exogenous demand shock stemming from the government, the capital account via investments, the rest of South Africa and the rest of the world for the relevant sectors mentioned can be stimulated in a number of ways. These include applying export controls on unprocessed metal products utilising export permits and, complete embargoes, as well as funding mechanisms (Hausmann et al., 2007). Other methods include competitive pricing mechanisms as well as restricting the imports of finished goods in downstream industries, noted by Kelegama & Foley (cited in Hausmann et al., 2007).

The Leontief inverse multipliers denote the production necessary, stimulated through both direct and indirect linkages, in input industries of the relevant sector to meet a R1 increase in final demand (Kavese, 2007). Multipliers will be greater for a corresponding input required by the commodity, rather than by the equivalent activity sector. That generally applies if it is a direct input demanded by the commodity sector, and an indirect input demanded by the activity sector and vice versa. Even if not directly demanded as an input, the multiplier will still exist via indirect economic linkages. Multipliers give an indication of the impact on welfare measures and on the magnitude of stimulation in upstream production.

Table 16, in Appendix C, presents the Leontief inverse multipliers for the basic metal products sector, as well as for the highlighted downstream industries for both the activity and commodity sectors. Let's consider the effect, of a R1 increase in final demand for the following commodities. Those being for basic metal, structural metal, other fabricated metal, machinery and equipment, as well as for the manufacturing of transport equipment commodities. This leads to an increase in basic metal commodities of R1.61, R0.38, R0.39, R0.46 and R0.05 respectively. Similarly the R1 increase for the commodities applied above, leads to a rise in the basic metal activity (production) industry of R1.22, R0.29, R0.297, R0.35 and R0.038 respectively. We note that there's little stimulation created for the basic iron & steel and aluminium sector by the manufacturing of transport equipment sector. While the remaining downstream industries produce significant stimulus in the basic metal sector, forming an integral part of the value chain.

Table 17, in Appendix C, presents a summary of the vital multipliers for each of the sectors in the value chain. To view the disaggregated multipliers pertaining to each sector, see Table 16. The importance of each sector in terms of economic multipliers and welfare multipliers will now be established. The GDP multipliers are created by summing the stimulated, both direct and indirect, upstream/input activities. The GDP multipliers are greatest in other fabricated metal activities followed closely by structural metal activities as well as in machinery and equipment activities of R2.6, R2.58, and R2.576 respectively, for a R1 increase in relevant activity demand. Commodity multipliers consist of summing the indirectly and directly stimulated commodity inputs. These are greatest for the machinery and equipment input commodities as well as in the manufacturing of transport equipment input commodities of R2.4 and R2.3, for a R1 increase in demand for the respective commodity sector. Moreover, the basic metal products sector has a large impact on production since, for a R1 increase in final demand for basic metal commodities, it leads to a rise in GDP worth R2.09. Additionally, a final demand shock of R1 for basic metal commodities stimulates the input commodity sectors worth R2.76. These values are all indicative

of significant economic stimulation stemming from a R1 increase in demand via direct and indirect input linkages.

An increased demand for a labour force occurs when there is increased production in an industry. This is since the model assumes fixed wages (prices) while the quantity of labour increases, via both the direct and indirect stimulated input industries. Other fabricated metal activities followed by structural metal activities, after that by machinery and equipment activities, have the greatest impact on labour creation. For every R1 increase in demand for the sectors mentioned above, it increases the required labour by R0.4, R0.39, and R0.36 respectively. Moreover, there is a creation of labour worth R0.36, for every R1 increase in demand for basic metal activities. Additionally, these sectors increase the working African population the most, relative to other racial groups, which is of particular importance given the prevalent racial inequalities in the country. These sectors stimulate the creation of African employment worth approximately R0.2 for every R1 in increased demand.

The skill levels most affected in the job creation process is in, the legislator, senior official, and manager levels, as well as in the professional skill level. These are both highly skilled employment groups. After that the craft and related trades skill grouping, as well as the plant & machine operators and assembler's skill level encounter job creation. Additionally, employment for domestic workers largely increases with structural metal activities as well as in other fabricated metal activities.

Capital is most stimulated in structural metal product activities, followed by other fabricated metal activities as well as in machinery and equipment activities. For a R1 increase in demand for these activities, it stimulates R0.462, R0.46 and R0.42 worth of capital respectively. Additionally basic metal activities stimulate capital, as a factor of production, worth R0.43 for every R1 in increased sector demand. We note that capital, as a factor of production, is slightly more stimulated than labour is. If the ratio of employment to capital were greater, the employment multipliers would be larger which allows for a more significant impact on the population's welfare.

It is important to assess import multipliers since imports create leakages in the multiplier creation process. This, in so far as, local demand is not at its potential level and hence leads to less job creation and economic growth. When demand for manufacturing of transport equipment commodities increases by R1, a value of R0.52 of imports creates leakages out of the multiplier process. Similarly, the machinery and equipment commodities sector has a significant import

multiplier of R0.5, which implies that leakages in the multiplier creation mechanism are present. If the import intensity of these sectors were to decrease, it would benefit welfare and economic stimulation in the province.

Finally, the government earns from the tax multipliers on production. These are largest, when demand increases, in other fabricated metal activities, in the structural metal activities sector, and in the machinery and equipment activities sector. A tax generation of approximately R0.18 occurs for every R1 increase in demand for the relevant production sector. Commodities earn tax revenue in a similar fashion. By increasing demand in the structural metal and other fabricated metal commodities sectors, tax earnings of R0.12 in both sectors result. A tax generation of roughly R0.14 occurs, for every R1 increase in demand for machinery and equipment commodities, as well as for the manufacturing of transport equipment commodities.

The iron & steel and aluminium value chain performs well when examining the impact on economic and welfare multipliers, due to increased demand for the relevant downstream sectors. This implies that promoting beneficiation in the iron & steel and aluminium industries are viable. The net effect on regional production is more than double the value of the initial stimulation for all of the considered sectors. This highlights the strong linkages, of the industries in the value chain, with the local economy. Job creation is indeed evident when demand increases, stressing the contribution to improved welfare in the province. Importantly, Africans benefit to the greatest extent, which is vital since racial inequality is plaguing the country.

However, employment created in the higher skilled jobs, such as managers and professionals, is worrying. This is since in the KZN region, with its high TB and HIV AIDS prevalence rates, we wish that the lower skilled groups would be increasingly employed who are more likely to be affected and, therefore, a better welfare position be created. Improved welfare would also be a positive outcome, from the standpoint of bumping up the aggregate skill level employed in the province, if the locals possess the skills required, allowing for a whole host of benefits. Moreover, the impact on taxes is positive which is beneficial for the government and for the provision of governmental services. Nevertheless, there are leakages in the multiplier creation mechanism via imports for all the sectors. The significant import multipliers in the transport equipment manufacturing and in the machinery and equipment sectors are problematic. They imply that substantial leakages are present and that locally stimulated demand will in fact fuel industries in other regions. If these import multipliers could decrease, through relevant policy, it would enhance the benefits stemming from the beneficiation process.

Moreover, we note that other fabricated metal products, as well as structural metal products have the most positive outcomes. This occurs across all multiplier categories and especially in comparison with the larger import multipliers seen in the transport equipment manufacturing as well as in the machinery and equipment products sector. It seems evident that demand for the structural metal products sector as well as for the fabricated metal products sector should be stimulated. These sectors consist of construction, packaging, infrastructure and the cable industry as highlighted in Tables 6 and 7. Since both create significant impacts on GDP, job creation, employment in a broader range of skill levels, as well as reducing leakage from the multiplier process. This allows for a greater impact on the local economy, via the direct and indirect linkages, to occur.

i. EXAMINING THE CONSUMPTION OF ELECTRICITY AND ITS IMPACT ON THE POTENTIAL OF INCREASED BENEFICIATION

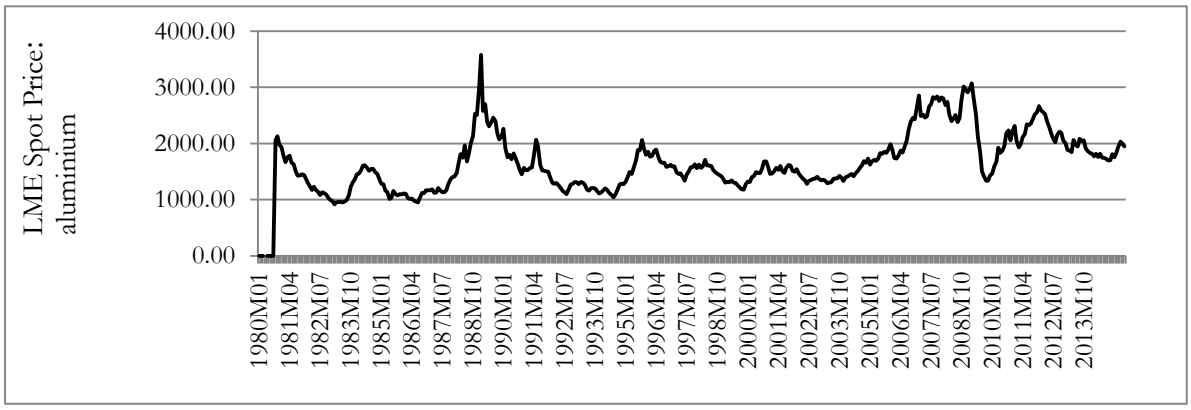
It is vital to assess the changing nature of power consumption, as an input, for the iron & steel and aluminium industries. Since it is a factor which can erode the positive economic and welfare effects which we have previously established exist in the beneficiation process. The metal manufacturing sector is considered to be extremely energy intensive. Deloitte (2011) indicates that about 17% of the metal manufacturing industry's operational costs are for electricity. Thus, an increase in production in the iron & steel or aluminium industry (precious & non-ferrous metals) would require additional electricity inputs and increase costs. ArcelorMittal indicated that 20% of its operational costs are electricity costs (Deloitte 2011; Kumba 2011).

According to the KZN SAM (Development Bank of Southern Africa, 2013b), the basic metal products sector utilises R1,687m of electricity inputs which account for 4.3% of its total expenditure. Examining the first round increases in electricity needed to meet a R1 increase in demand for basic metals, we note that R0.04 (R1,687m/R39,327m) of electricity as an input is required. The total indirect and direct impact for electricity needed in a R1 increase in the demand for aluminium and iron & steel via stimulation of the relevant downstream industries is R0.0826, which is double the existing electricity requirement.

With the real electricity price increases experienced post-2007, it is likely that this SAM does not accurately reflect the actual nature of current power usage and pricing. Deloitte (2011) indicated that the real price of electricity has risen by 78% from 2008 to 2011, which is a significant change. The aluminium sector has entered into an ad hoc pricing agreement with Eskom in

which its tariff is linked to the London Metal Exchange Aluminium price (LME) (Kohler, 2013). For this reason, the aluminium sector is not fully absorbing the cost of the energy utilised as well as the real electricity price increases faced by other sectors of the economy. In order to validate a non-price mechanism for allocating energy resources in a constrained sector, the benefits to the economy must outweigh the costs of this subsidization. We note that the LME spot price in 2006 is roughly equivalent to the 2014 price as portrayed in Figure 1. Thus, aluminium's electricity cost in the SAM would not be significantly different in years that are more recent. However the same does not pertain to the iron and steel industry nor to the downstream industries.

Figure 1: LME aluminium spot price



(IMF, 2014)

There are limitations to this analysis, as the specific data for KZN is not accessible, for this reason updating of the SAM has not been achieved. National electricity intensity figures will be utilised to examine the change in usage, as neither iron, steel or aluminium's production technology (input requirements) differ provincially, from those techniques nationally, or even internationally. This is as many of the companies operating in South Africa have international production affiliations. This is true since ArcelorMittal operates in the KZN iron and steel sector as well as in various other regions of the country (Kumba, 2011). The same goes for the aluminium industry in which BHP Billiton is a global player (BHP Billiton, 2013). Next, examine the national electricity consumption of the iron and steel industry from 2000 to 2008 in Table 8. We note the growth in iron & steel energy usage and the relatively small change in consumption in the precious & non-ferrous metals industries. Furthermore, in the 2009 national input-output tables, the iron & steel sector utilised 4.1% of electricity; hot water and gas as an industry input, and in the 2011 input-output table it used 4.2% in inputs (Statistics South Africa 2013; Statistics South Africa 2014b). Moreover, the precious & non-ferrous metals sector made use of 6.6% of

electricity, hot water and gas in the 2009 input-output tables and in 2011, the sector made use of 6.9% as inputs (Statistics South Africa 2013; Statistics South Africa 2014b).

What the relatively small change in the usage of electricity points towards, as specified by Deloitte (2011) and Statistics South Africa (2013; 2014b), is that the South African iron & steel and aluminium industries have not undergone significant structural changes in terms of intensity. However, as mentioned, there have been significant price hikes post-2008, but which has not been reflected in an increase in the basic metal product's expenditure nor in the downstream industries in the SAM, where ad-hoc pricing agreements are absent. Despite this shortcoming, the bigger picture of the relative effects on indicative multipliers and on the ability to stimulate output in the region is not considerably affected due to the absence of significant structural changes.

Table 8: Electricity usage of the aluminium and iron and steel sectors

Year	**Sector**	**Electricity usage GWh (thousands)**
2000	Iron & steel	21
	Precious & non-ferrous metals	15
2003	Iron & steel	22
	Precious & non-ferrous metals	17
2006	Iron & steel	24
	Precious & non-ferrous metals	18
2008	Iron & steel	25
	Precious & non-ferrous metals	16

(Deloitte, 2011)

Moreover, it is important to consider the impact that electricity price hikes could have on the production of the iron & steel and non-ferrous metals sectors since it is and was post-2006 an imminent reality in South Africa. The Pan-African Investment and Research Services (2011) conducted a study in which they utilised computational general equilibrium analysis to determine the impact of a price-hike on production in the industry groups. It was calculated that a 24.8% electricity price-hike would lead to a decline in production of 5.3% in the iron and steel sector (Pan-African Investment & Research Services, Eskom, 2011). Similarly, the 24.8% price-hike would result in a contraction of output of 4.6% in the Non-ferrous metals sector (Pan-African Investment & Research Services, Eskom, 2011). This is an important factor to consider when examining proposals for stimulating beneficiation. Price-hikes are indeed likely and lead to

significant declines in output, which may erode the increased production and welfare benefits stemming from successful beneficiation projects.

A noteworthy finding, is that a combined shock of 18% in greater capital expenditure, leads to an increased electricity capacity, and a 24.8% hike in the electricity price results in a slight output increase in both industries (Pan-African Investment & Research Services, Eskom, 2011). The result of these two concurrent shocks, is that output in the iron & steel sector increases by 0.65%, whilst output in the non-ferrous metals sector expands by 0.25% (Pan-African Investment & Research Services, Eskom, 2011). For this reason, despite the imminent electricity price-hikes, with adequate capital expenditure which results in greater electricity production, output is not negatively affected. The capital expenditure impact outweighs the price shock, and the potential of stimulated economic linkages promoted by beneficiation is not adversely affected. It would, therefore, seem that a doubling of electricity required, when the basic metal products sector is stimulated via the downstream industries (as found in the KZN SAM) is possible to achieve, even with price increases, as long as capital expenditure in the electricity sector is undertaken. This is however an issue in South Africa as there is already a constrained electricity sector and an increased supply is not necessarily available. Capital expenditure on increasing the electricity supply is additionally not occurring at fast enough rates.

Highly energy intensive sectors in South Africa are in fact heavily dependent on coal. This is attributable to the provision by coal of 77% of local energy needs (Eskom, 2015). A common argument, for this reason, in examining mineral beneficiation, is that it involves the beneficiation of domestic coal supplies, rather than of the mineral concerned. In the aluminium industry, secondary aluminium, which uses scrap as the main feedstock, is 95% less energy intensive than that of primary aluminium (The Green House and The Minerals to Metals Initiative, 2014a; US Energy Information Administrator, 2012). It would be beneficial therefore, to revise the production technique for primary aluminium to reflect that of secondary aluminium production. An energy intensity reduction of 25% is achievable for the production of primary aluminium, by utilising direct carbothermic reduction (Paulson, 2001). Moreover, for the steel making process, it would be favourable if the electric-arc furnace method were not the preferred method, since electricity consumption is considerable (Kumba, 2011, p.2). If the industries undergo these changes, then the focus of beneficiation would move from the beneficiation of coal, to that of the mineral concerned. The implicit subsidisation received by the aluminium industry, in terms of ad-hoc pricing agreements from Eskom would also be less of an issue, if it altered its energy usage as per the suggested means.

Altogether we note the drawback to increasing production in the iron & steel and aluminium industry, via stimulation in the downstream industries, as it requires an increase in power supply, which is currently not readily available. Therefore it is suggested that migration occurs towards secondary aluminium or even the use of direct carbothermic reduction in the aluminium industry (Paulson, 2001; US Energy Information Administrator, 2012). Additionally, the avoidance of the electric-arc furnace method in steel production should be achieved (Kumba, 2011, p.2). The short term solution, however, would be to have readily available power. Moreover, electricity price-hikes will force decreased production in the aluminium and iron and steel industry. This will occur unless capital investment in the energy sector or movements to less energy intensive methods ensue (Pan-African Investment & Research Services, Eskom, 2011). Without the migration to a less energy intensive industry or the short term solution of increased power supply, the positive welfare and economic indicators established will be eroded. This migration is also necessary to eradicate the conception that mineral beneficiation is in fact beneficiating coal rather than the mineral concerned.

7) CONCLUSION

Kwazulu-Natal faces a host of economic and demographic issues which the manufacturing sector, as the largest contributor to GDP, can assist to address. This paper focused on the beneficiation taking place within the iron & steel and aluminium industries once the basic metals have been produced i.e. within the manufacturing sector. It sought to establish whether Kwazulu-Natal's basic metal product (iron & steel and aluminium) value chain has a significant impact on economic and welfare linkages. This was done through the use of the provincial social accounting matrix to and the associated Leontief multipliers. The study attempted to capture the disaggregated relations within the first level of beneficiation and the subsequent downstream industries.

The multiplier analysis found that the net effect on regional production was more than double the value of the initial stimulation for each of the considered sectors in the value chain. This highlighted the strong linkages between primary beneficiation and downstream industries with the local economy. In an era of jobless growth it was noted that job creation became evident when demand increased and that much of this employment went to the previously disadvantaged, stressing the contribution to improved welfare in the province. 'Structural metal

products' and 'other fabricated metal products' demonstrated the most positive impacts on the economic and welfare linkages.

An issue that emerged was the leakages that arose within these sectors. Imports are strongly stimulated when demand these metals is increased. By examining the SAM, it was established that the industries spend more on import payments than was obtained in export receipts. If these sectors continue to be encouraged then to maximize stimulation through the economic linkages it may be necessary use policy to decrease the import intensity.

The metal manufacturing sector was found to be highly energy intensive, with coal providing most of the local energy needs. This has given rise to the perception that it is coal which is being beneficiated rather than the mineral concerned. It was found that electricity price-hikes and the current low degree of capital investment in the electricity sector are likely to decrease production in the iron & steel and aluminium industries. The current constrained electricity supply may be insufficient to accommodate the needs of increased production by downstream industries if these are stimulated.

In conclusion we note that while there are significant economic and welfare gains stemming from the increased beneficiation of the iron & steel and aluminium industries, there are relevant drawbacks in terms of constrained electricity supply and significant leakages created by imports. In an era when electricity supply is proving a binding constraint on the regional economy, the costs of running smelters to process imported bauxite are profound. The costs and time lags involved in power station construction have been well established through recent experience. As a question for ongoing research one can ask; what would be the cost of buying out the province's aluminium smelters and immediately releasing their current power usage into the national grid?

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APPENDIX A

Table 11: Social accounting matrix for Kwazulu-Natal in Millions of Rands (2006 prices)

			Activities	Commodities	Current accounts				Current accounts			Capital accounts		Trade Accounts				Total
					Factor Payments		Institutions											
					Labour	Capital (GOS)	Enterprises	Households	Government			Government	All other sectors	Rest of SA	Rest of the World	Capital	Residual	
									Central	*Provincial*	*Local*							
Activities			0	587731	0	0	0	0	0	0	0	0	0	0	0	0	75	587806
Commodities			367991	0	0	0	0	189958	6820	9455	9681	7400	48875	121435	36547	0	19859	818021
Current Accounts	Factor Payments	Labour	91781	0	0	0	0	0	14354	18337	6459	0	0	42357	764	0	0	174053
		Capital	123608	0	0	0	0	0	0	0	0	0	0	30467	5800	0	946	160820
	Institutions	Enterprises	0	0	0	66728	0	0	1568	1	444	0	0	0	0	0	9503	78243
		Households	0	0	147974	0	43327	2336	16284	2831	0	0	0	446	107	0	10464	223770
		Central Government	149	34239	0	1891	19005	20928	2031	0	0	0	0	0	0	0	1015	79259
		Provincial Government	33	0	0	102	416	0	35422	0	0	0	0	0	0	0	0	35972
		Local Government	4170	0	0	0	1928	303	4117	261	0	0	0	0	0	0	0	10778
Capital accounts	Government		0	0	0	5928	0	0	-2352	5088	-5806	0	0	0	0	0	0	2858
	All other sectors		0	0	0	34734	3977	-743	0	0	0	0	0	0	0	0	0	37968
Trade	Rest of RSA		0	77026	24912	36522	0	443	0	0	0	0	0	0	0	55802	0	194705
	Rest of the World		0	101905	1167	11229	88	80	0	0	0	0	0	0	0	-71251	0	43218
	Capital		0	0	0	0	0	0	0	0	0	-4542	-10907	0	0	0	0	-15449
	Residual		-75	-17120	0	1795	-9503	-10464	-1015	0	0	0	0	0	0	0	0	2740
Total			587806	818021	174053	160820	78243	223770	79259	35972	10778	2858	37968	194705	43218	-15449	2740	2434761

APPENDIX B

Expanded KZN SAM

Table 12: Expanded KZN SAM: Total expenditure by Commodity Accounts

	Commodities											
	Sugar Cane Farming	Livestock Farming	Dairy Farming	Forestry	Other Agriculture products	Coal Mining	Other mining & quarrying products	Meat, Fish, Fruit, Vegetables, Oils and Fat	Dairy Products	Grain Mill, Bakery and Animal Feed	Other food products	Beverages and tobacco products
Total demand for activities (own sector only)	3657.8	3697.8	1059.7	3789.0	10704.7	795.0	8409.8	16169.6	2542.6	8277.2	6030.9	5533.6
Total demand for commodities	494.4	480.7	82.2	298.2	1118.8	75.0	1070.8	1103.9	216.1	291.0	439.3	371.5
Total payments to labour by race:												
Africans	0	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0	0
Total factor payments to capital	0	0	0	0	0	0	0	0	0	0	0	0
Total demand for enterprises	0	0	0	0	0	0	0	0	0	0	0	0
Total payments to household by race:												
Africans	0	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:												
National	127.5	143.2	52.6	172.6	403.1	1.3	9.1	1691.0	195.3	531.3	255.5	439.4
Provincial	0	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0	0
Total savings to :												
Government	0	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:												
South Africa	22.3	7.1	15.5	100.4	420.6	1795.2	930.0	6513.2	12.7	26.0	1292.3	464.8
ROW	0	169.4	7.9	44.0	1392.4	57.3	17061.4	12.2	78.0	618.2	526.7	447.0
Capital	0	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**4302.0**	**4498.3**	**1217.9**	**4404.3**	**14039.6**	**2723.8**	**27481.1**	**25489.9**	**3044.7**	**9743.7**	**8544.6**	**7256.3**

	Commodities										
	Textiles, Clothing, Leather Products and Footwear	Wood and Wood Products	Furniture	Paper and Paper Products	Publishing and Printing	Petroleum	Chemicals & Chemical Products (incl Plastic Products)	Rubber Products	Non-Metallic Mineral Produc	Basic Metal Products	Structural Metal Products
Total demand for activities (own sector only)	19461.6	3657.8	4711.3	24537.7	2276.5	17521.9	37374.6	2148.5	3509.7	39327.4	1210.8
Total demand for commodities	4750.5	421.0	832.4	824.3	174.9	2092.2	2544.2	241.7	329.0	3882.1	94.6
Total payments to labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor payments to capital	0	0	0	0	0	0	0	0	0	0	0
Total demand for enterprises	0	0	0	0	0	0	0	0	0	0	0
Total payments to household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:											
National	1551.9	150.2	178.6	756.6	130.0	2420.4	5090.7	212.6	311.7	569.8	66.9
Provincial	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0
Total savings to :											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:											
South Africa	7054.8	439.0	156.4	1682.4	771.8	1678.6	1106.4	748.6	875.6	4398.0	1075.1
ROW	4801.5	469.2	43.0	1608.2	547.3	6969.0	6732.8	403.1	192.9	3601.8	245.7
Capital	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**37620.3**	**5137.2**	**5921.8**	**29409.2**	**3900.5**	**30682.1**	**52848.8**	**3754.5**	**5218.9**	**51779.0**	**2693.2**

	Commodities										
	Other Fabricated Metal Products	Machinery & Equipment	Electrical Machinery & Apparatus	Communication, Medical and other Electronic Equipment	Manufacturing of Transport Equipment	Other Manufacturing & Recycling	Electricity	Water	Buildings & Construction	Trade	Accommodation
Total demand for activities (own sector only)	3832.2	14794.7	1743.5	1824.6	37016.5	1556.6	10305.2	3233.7	24093.4	61941.0	8355.6
Total demand for commodities	355.9	2373.0	130.3	650.0	13799.8	113.0	1542.3	213.1	1954.7	-53467.9	547.7
Total payments to labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor payments to capital	0	0	0	0	0	0	0	0	0	0	0
Total demand for enterprises	0	0	0	0	0	0	0	0	0	0	0
Total payments to household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:											
National	224.1	475.2	1358.2	633.1	2492.2	142.3	608.2	129.2	854.2	743.0	193.0
Provincial	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0
Total savings to :											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:											
South Africa	2385.5	46.2	6039.9	1244.1	3840.6	915.5	2089.8	194.7	610.4	10642.2	376.3
ROW	1869.0	7904.6	852.6	4269.1	21979.1	619.2	430.2	0.0	87.7	100.9	1818.0
Capital	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**8666.6**	**25593.7**	**10124.5**	**8621.0**	**79128.3**	**3346.6**	**14975.7**	**3770.6**	**27600.4**	**19959.2**	**11290.6**

	Commodities										
	Transport services - Rail	Transport services - Road	Transport services - Harbour	Transport services - Taxi's	Transport - Other	Communications	Insurance	Real estate	Business activities	General Government	Personal Services
Total demand for activities (own sector only)	12021.7	10884.7	1909.1	737.6	17208.4	30705.3	26686.5	48773.2	12430.4	0	31271.7
Total demand for commodities	-8.1	14.0	-62.0	-15.2	1660.5	2063.1	374.7	2413.7	101.2	0	3017.2
Total payments to labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor payments to capital	0	0	0	0	0	0	0	0	0	0	0
Total demand for enterprises	0	0	0	0	0	0	0	0	0	0	0
Total payments to household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:											
National	68.4	85.8	8.6	6.6	146.0	1959.5	1760.5	2399.3	1379.7	0	3110.9
Provincial	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0
Total savings to :											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:											
South Africa	426.0	604.5	461.1	44.4	630.8	34.2	1659.6	7866.4	4453.2	0	873.8
ROW	3210.2	3006.8	452.0	181.9	4410.1	1297.6	1513.3	214.4	1009.2	0	649.8
Capital	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**15718.2**	**14595.8**	**2768.7**	**955.4**	**24055.8**	**36059.7**	**31994.7**	**61667.0**	**19373.6**	**0**	**38923.5**

Table 13: Expanded KZN SAM: Total income received by Commodity Accounts

	Commodities											
	Sugar Cane Farming	Live stock Farming	Dairy Farming	Forestry	Other Agriculture products	Coal Mining	Other mining & quarrying products	Meat, Fish, Fruit, Vegetables, Oils and Fat	Dairy Products	Grain Mill, Bakery and Animal Feed	Other food products	Beverages and tobacco products
Total demand by activities	492.5	997.1	726.6	1936.5	12100.9	3932.4	12076.9	4357.7	1868.6	2360.0	2044.5	1180.9
Total demand by commodities	0	0	0	0	0	0	0	0	0	0	0	0
Total income received from labour by race:												
Africans	0	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:												
Africans	5.5	1767.3	253.5	0	367.5	0	0	16821.9	544.3	4744.3	1646.1	3704.3
Coloureds	0.2	94.2	9.9	0	12.1	0	0	691.1	23.9	108.1	58.8	154.7
Indians/Asians	1.6	593.5	61.2	0	73.8	0	0	4350.4	167.8	720.5	386.0	731.5
Whites	1.0	484.4	65.8	0	93.5	0	0	2903.3	113.5	369.7	244.8	756.2
Total income from government:												
National	0.01	0	0.00	0	0	0	0.9	0	0	0	18.0	0.1
Provincial	0.6	3.0	0.4	11.0	0	0	1.0	0	0	0	53.3	0.8
Local	0.01	0	0.00	0	0	0	2.4	0	0	0	12.4	0.8
Total investment from :												
Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corporate sector and households	6.0	72.4	21.5	85.3	90.3	196.5	2430.2	596.6	65.9	190.4	909.1	294.2
Total exports of goods and services to:												
South Africa	0.0	401.7	55.6	215.4	1340.0	69.6	219.6	1093.5	234.3	890.1	3432.8	716.2
ROW	0.0	13.1	41.7	56.8	158.5	31.1	833.3	236.5	17.4	341.1	919.2	58.4
Capital	0	0	0	0	0	0	0	0	0	0	0	0
Residual	3794.7	71.8	-18.2	2099.2	-197.2	-1505.8	11917.0	-5561.1	9.0	19.5	-1180.4	-341.7
Total income	**4302.0**	**4498.3**	**1217.9**	**4404.3**	**14039.6**	**2723.8**	**27481.1**	**25489.9**	**3044.7**	**9743.7**	**8544.6**	**7256.3**

	Commodities										
	Textiles, Clothing, Leather Products and Footwear	Wood and Wood Products	Furniture	Paper and Paper Products	Publishing and Printing	Petroleum	Chemicals & Chemical Products (incl Plastic Products)	Rubber Products	Non-Metallic Mineral Products	Basic Metal Products	Structural Metal Products
Total demand by activities	22214.1	4021.0	909.1	19400.5	3318.0	8543.4	36943.1	1987.9	3910.8	37845.8	2100.1
Total demand by commodities	0	0	0	0	0	0	0	0	0	0	0
Total income received from labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:											
Africans	9867.6	18.1	0	328.4	125.7	5042.2	4933.6	446.6	139.6	0	0
Coloureds	337.9	0.5	0	17.7	9.4	224.6	201.6	13.9	2.8	0	0
Indians/Asians	1738.0	2.9	0	106.7	35.7	1892.0	1522.1	111.9	17.8	0	0
Whites	1269.2	2.9	0	64.5	104.9	2133.8	1554.1	143.2	60.6	0	0
Total income from government:											
National	0	0	4.9	111.5	9.4	33.3	12.0	100.9	6.8	2.0	60.6
Provincial	0	0	142.1	336.6	99.8	68.1	52.0	221.8	7.5	26.4	231.1
Local	0	0	64.8	68.0	45.8	68.0	133.3	59.8	273.6	10.8	395.1
Total investment from :											
Government	0	0.3	21.0	0	0.8	0	0.3	1.7	0	88.7	34.6
Corporate sector and households	1401.4	114.9	498.4	390.1	118.7	1543.5	84.8	1223.2	578.8	1059.1	411.9
Total exports of goods and services to:											
South Africa	4754.9	955.3	1657.3	10873.5	634.7	10112.9	6912.6	30.8	950.8	61.1	322.5
ROW	1184.6	307.0	43.5	2157.4	27.9	1525.0	1042.4	64.1	7.2	15997.8	66.4
Capital	0	0	0	0	0	0	0	0	0	0	0
Residual	-5147.3	-285.5	2580.8	-4445.6	-630.3	-504.6	-543.2	-651.4	-737.5	-3312.8	-928.9
Total income	**37620.3**	**5137.2**	**5921.8**	**29409.2**	**3900.5**	**30682.1**	**52848.8**	**3754.5**	**5218.9**	**51779.0**	**2693.2**

	Commodities										
	Other Fabricated Metal Products	Machinery & Equipment	Electrical Machinery & Apparatus	Communication, Medical and other Electronic Equipment	Manufacturing of Transport Equipment	Other Manufacturing & Recycling	Electricity	Water	Buildings & Construction	Trade	Accommodation
Total demand by activities	4866.1	10777.4	3266.0	1914.7	39658.0	1350.9	5837.1	1996.4	15192.7	7706.2	1206.9
Total demand by commodities	0	0	0	0	0	0	0	0	0	1.13687 E-11	0
Total income received from labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:											
Africans	163.5	0	1598.7	668.5	6761.2	1312.6	1364.6	1033.2	0	3640.1	1670.5
Coloureds	3.3	0	44.4	39.0	504.3	47.0	48.8	37.0	0	162.0	68.5
Indians/Asians	20.8	0	262.5	114.0	4195.8	338.7	352.1	266.6	0	1030.0	600.2
Whites	70.9	0	347.2	174.5	5870.8	274.1	285.0	215.8	0	1095.9	951.6
Total income from government:											
National	18.5	124.6	2021.0	44.7	0.7	5.6	0	5.1	0.3	26.6	0
Provincial	281.0	1190.8	3357.8	84.3	48.9	73.2	0	43.1	0.5	36.3	0
Local	193.2	252.7	1706.5	80.6	39.8	41.0	0	61.8	0.9	99.9	0
Total investment from :											
Government	469.1	636.0	185.7	491.5	564.5	1.3	2938.5	0	1820.2	0	0
Corporate sector and households	3944.1	4848.5	1998.3	5860.4	7179.8	4.8	5530.8	0	5802.7	0	0
Total exports of goods and services to:											
South Africa	647.6	7172.6	454.5	522.3	13068.4	584.5	1055.6	330.1152	5403.8	13362.3	1825.1
ROW	93.5	1400.7	59.8	83.5	5052.9	80.9	0	0	0	1649.4	815.9
Capital	0.0	0.0	0.0	0	0	0	0	0	0	0	0
Residual	-2105.1	-809.6	-5178.1	-1457.0	-3816.7	-767.9	-2436.8	-218.5	-620.6	-8849.6	4151.9
Total income	**8666.6**	**25593.7**	**10124.5**	**8621.0**	**79128.3**	**3346.6**	**14975.7**	**3770.6**	**27600.4**	**19959.2**	**11290.6**

	Commodities										
	Transport services - Rail	Transport services - Road	Transport services - Harbour	Transport services - Taxi's	Transport - Other	Communications	Insurance	Real estate	Business activities	General Government	Personal Services
Total demand by activities	4957.6	3743.0	168.4	65.2	6001.1	22663.6	8521.7	18939.9	17861.9	0.0	6027.6
Total demand by commodities	0	0	0	0	0	0	0	0	0	0	0
Total income received from labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:											
Africans	195.4	1830.0	569.3	518.1	1825.9	3486.1	8776.1	29678.9	157.5	0.0	4277.1
Coloureds	7.4	69.4	21.6	19.6	69.2	228.7	768.1	228.7	9.0	0.0	143.6
Indians/Asians	49.2	461.1	143.5	130.6	460.1	1751.2	3721.5	3951.4	66.1	0.0	1054.2
Whites	44.3	414.4	128.9	117.3	413.5	1760.2	5728.5	4230.3	78.6	0.0	1143.4
Total income from government:											
National	22.6	666.8	79.3	23.2	358.8	28.7	65.2	2309.9	386.7	0.0	271.5
Provincial	48.2	1412.2	163.8	48.0	802.9	178.6	178.7	29.6	105.7	0.0	115.6
Local	48.6	1406.4	155.9	45.7	872.7	473.7	526.0	1423.6	976.4	0.0	140.9
Total investment from :											
Government	0.0	41.8	0.0	0.0	0.0	0.0	0.0	92.1	12.1	0.0	0.0
Corporate sector and households	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1274.0	48.9	0.0	0.0
Total exports of goods and services to:											
South Africa	3414.3	2318.6	1491.1	20.9	2447.8	4890.9	4879.4	6077.7	3355.7	0.0	2176.4
ROW	571.4	388.0	249.5	3.5	409.6	292.3	172.8	25.9	33.9	0.0	32.7
Capital	0	0	0	0	0	0	0	0	0	0	0
Residual	6359.3	1844.2	-402.6	-36.8	10394.2	305.6	-1343.5	-6595.0	-3718.8	0.0	23540.5
Total income	**15718.2**	**14595.8**	**2768.7**	**955.4**	**24055.8**	**36059.7**	**31994.7**	**61667.0**	**19373.6**	**0.0**	**38923.5**

Table 14: Expanded KZN SAM: Total expenditure by Activity Accounts

	Activities											
	Sugar Cane Farming	Livestock Farming	Dairy Farming	Forestry	Other Agriculture products	Coal Mining	Other mining & quarrying products	Meat, Fish, Fruit, Vegetables, Oils and Fat	Dairy Products	Grain Mill, Bakery and Animal Feed	Other food products	Beverages and tobacco products
Total demand for activities	0	0	0	0	0	0	0	0	0	0	0	0
Total demand for other commodities	1469.2	2227.8	690.1	1804.4	5631.0	249.1	4635.8	14706.8	1909.8	6614.9	3203.4	2270.7
Total demand for basic metal products	0.0	26.8	0.0	56.7	70.2	7.2	359.3	13.0	2.2	3.0	5.4	0.1
Total payments to labour by race:												
Africans	486.5	326.7	82.2	441.1	1127.7	146.7	1013.9	378.5	163.8	430.2	731.7	844.4
Coloureds	10.4	7.0	1.8	9.4	24.2	3.9	27.1	19.6	8.5	22.3	37.9	43.7
Indians/Asians	72.0	48.3	12.2	65.3	166.8	27.0	186.8	143.4	62.0	162.9	277.1	319.8
Whites	80.7	54.2	13.6	73.2	187.1	17.9	123.7	125.4	54.3	142.5	242.4	279.7
Total factor payments to capital	1635.2	1098.3	276.2	1482.8	3790.8	343.9	2377.1	784.7	339.5	891.7	1516.8	1750.4
Total demand for enterprises	0	0	0	0	0	0	0	0	0	0	0	0
Total payments to household by race:												
Africans	0	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:												
National	-61.2	-41.1	-10.3	-55.5	-142.0	0.9	6.3	-1.9	-0.8	-2.2	-3.7	-4.3
Provincial	-50.6	-34.0	-8.5	-45.8	-117.2	0.6	4.4	-1.9	-0.8	-2.1	-3.7	-4.2
Local	15.7	10.5	2.7	14.2	36.4	5.0	34.8	15.0	6.5	17.0	28.9	33.4
Total savings to:												
Government	0	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:												
South Africa	0	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**3657.8**	**3697.8**	**1059.7**	**3789.0**	**10704.7**	**795.0**	**8409.8**	**16169.6**	**2542.6**	**8277.2**	**6030.9**	**5533.6**

	Activities										
	Textiles, Clothing, Leather Products and Footwear	Wood and Wood Products	Furniture	Paper and Paper Products	Publishing and Printing	Petroleum	Chemicals & Chemical Products (incl Plastic Products)	Rubber Products	Non-Metallic Mineral Products	Basic Metal Products	Structural Metal Products
Total demand for activities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total demand for other commodities	14833.8	2389.3	3014.7	17741.0	1006.0	14577.7	27706.3	1544.8	2276.8	29709.7	839.6
Total demand for basic metal products	7.5	313.8	390.7	373.0	1.9	127.0	1663.2	33.5	386.2	18676.4	603.2
Total payments to labour by race:											
Africans	1197.6	328.3	439.0	1758.8	328.8	761.9	2501.9	156.2	319.0	2488.8	96.1
Coloureds	62.0	17.0	22.7	91.1	17.0	39.5	129.6	8.1	16.5	128.9	5.0
Indians/Asians	453.6	124.3	166.3	666.2	124.5	288.6	947.6	59.2	120.8	942.7	36.4
Whites	396.7	108.8	145.4	582.7	108.9	252.4	828.9	51.7	105.7	824.5	31.8
Total factor payments to capital	2482.5	680.5	910.1	3646.1	681.6	1579.4	5186.5	323.8	661.4	5159.3	199.1
Total demand for enterprises	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total payments to household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:											
National	-6.0	-1.7	-2.2	-8.9	-1.7	-3.8	-12.6	-0.8	-1.6	-12.6	-0.5
Provincial	-6.0	-1.6	-2.2	-8.8	-1.6	-3.8	-12.5	-0.8	-1.6	-12.4	-0.5
Local	47.4	13.0	17.4	69.6	13.0	30.1	99.0	6.2	12.6	98.4	3.8
Total savings to:											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:											
South Africa	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**19461.6**	**3657.8**	**4711.3**	**24537.7**	**2276.5**	**17521.9**	**37374.6**	**2148.5**	**3509.7**	**39327.4**	**1210.8**

	Activities										
	Other Fabricated Metal Products	Machinery & Equipment	Electrical Machinery & Apparatus	Communication, Medical and other Electronic Equipment	Manufacturing of Transport Equipment	Other Manufacturing & Recycling	Electricity	Water	Buildings & Construction	Trade	Accommodation
Total demand for activities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total demand for other commodities	2666.4	11219.0	1279.8	1387.5	32666.0	790.9	5180.4	2184.0	18647.0	29388.7	5905.4
Total demand for basic metal products	1966.7	6221.1	717.6	192.5	861.5	409.1	0.0	201.1	2049.9	157.8	39.6
Total payments to labour by race:											
Africans	301.7	925.3	120.0	113.1	1125.8	198.2	1362.8	279.1	2265.7	11103.0	835.7
Coloureds	15.6	47.9	6.2	5.9	58.3	10.3	39.8	8.2	75.0	348.4	26.2
Indians/Asians	114.3	350.5	45.5	42.8	426.4	75.1	271.3	55.6	414.9	2449.1	184.3
Whites	99.9	306.5	39.8	37.5	373.0	65.6	175.6	36.0	372.0	1659.0	124.9
Total factor payments to capital	625.4	1918.1	248.8	234.5	2333.8	410.8	3253.8	666.4	2227.4	16357.5	1231.2
Total demand for enterprises	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total payments to household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:											
National	-1.5	-4.7	-0.6	-0.6	-5.7	-1.0	-10.8	-2.2	13.5	93.6	7.0
Provincial	-1.5	-4.6	-0.6	-0.6	-5.6	-1.0	-9.7	-2.0	9.6	66.6	5.0
Local	11.9	36.6	4.7	4.5	44.5	7.8	42.1	8.6	68.2	475.0	35.8
Total savings to:											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:											
South Africa	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**3832.2**	**14794.7**	**1743.5**	**1824.6**	**37016.5**	**1556.6**	**10305.2**	**3233.7**	**24093.4**	**61941.0**	**8355.6**

	Activities										
	Transport services - Rail	Transport services - Road	Transport services - Harbour	Transport services - Taxi's	Transport - Other	Communications	Insurance	Real estate	Business activities	General Government	Personal Services
Total demand for activities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total demand for other commodities	7199.6	6518.7	1143.3	441.8	9461.9	17673.5	7414.5	33172.0	1417.8	0.0	11180.1
Total demand for basic metal products	156.5	200.1	37.0	11.1	67.7	1090.4	3.2	149.6	0.2	0.0	192.7
Total payments to labour by race:											
Africans	1268.0	1148.1	201.4	77.8	1920.7	3342.6	3306.3	2676.6	1889.3	0.0	6216.5
Coloureds	40.1	36.3	6.4	2.5	60.7	105.6	209.0	169.2	119.4	0.0	318.1
Indians/Asians	297.3	269.2	47.2	18.2	450.4	783.8	1318.9	1067.7	753.7	0.0	1715.2
Whites	230.8	209.0	36.7	14.2	349.7	608.5	1726.1	1397.3	986.4	0.0	1785.5
Total factor payments to capital	2901.4	2627.0	460.8	178.0	4835.5	7967.5	11858.0	9599.4	6776.0	0.0	9098.6
Total demand for enterprises	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total payments to household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total payments to government:											
National	7.8	7.1	1.2	0.5	12.5	21.1	100.9	81.7	57.6	0.0	140.1
Provincial	4.9	4.4	0.8	0.3	7.9	13.2	68.0	55.1	38.9	0.0	99.5
Local	71.7	64.9	11.4	4.4	109.2	189.4	684.7	554.3	391.3	0.0	718.1
Total savings to:											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total imports for goods and services from:											
South Africa	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0
Discrepancy	0	0	0	0	0	0	0	0	0	0	0
Total expenditure	**12021.7**	**10884.7**	**1909.1**	**737.6**	**17208.4**	**30705.3**	**26686.5**	**48773.2**	**12430.4**	**0.0**	**31271.7**

Table 15: Expanded KZN SAM: Total income received by Activity Accounts

	Activities											
	Sugar Cane Farming	Livestock Farming	Dairy Farming	Forestry	Other Agriculture products	Coal Mining	Other mining & quarrying products	Meat, Fish, Fruit, Vegetables, Oils and Fat	Dairy Products	Grain Mill, Bakery and Animal Feed	Other food products	Beverages and tobacco products
Total demand by activities	0	0	0	0	0	0	0	0	0	0	0	0
Total demand by commodities (own sector)	3657.8	3697.8	1059.7	3789.0	10704.7	795.0	8409.8	16169.6	2542.6	8277.2	6030.9	5533.6
Total income received from labour by race:												
Africans	0	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:												
Africans	0	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0	0
Total income from government:												
National	0	0	0	0	0	0	0	0	0	0	0	0
Provincial	0	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0	0
Total investment from :												
Government	0	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0	0
Total exports of goods and services to:												
South Africa	0	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0	0
Residual	0	0	0	0	0	0	0	0	0	0	0	0
Total income	**3657.8**	**3697.8**	**1059.7**	**3789.0**	**10704.7**	**795.0**	**8409.8**	**16169.6**	**2542.6**	**8277.2**	**6030.9**	**5533.6**

	Activities										
	Textiles, Clothing, Leather Products and Footwear	Wood and Wood Products	Furniture	Paper and Paper Products	Publishing and Printing	Petroleum	Chemicals & Chemical Products (incl Plastic Products)	Rubber Products	Non-Metallic Mineral Products	Basic Metal Products	Structural Metal Products
Total demand by activities	0	0	0	0	0	0	0	0	0	0	0
Total demand by commodities (own sector)	19461.6	3657.8	4711.3	24537.7	2276.5	17521.9	37374.6	2148.5	3509.7	39327.4	1210.8
Total income received from labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total income from government:											
National	0	0	0	0	0	0	0	0	0	0	0
Provincial	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0
Total investment from :											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total exports of goods and services to:											
South Africa	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0
Residual	0	0	0	0	0	0	0	0	0	0	0
Total income	**19461.6**	**3657.8**	**4711.3**	**24537.7**	**2276.5**	**17521.9**	**37374.6**	**2148.5**	**3509.7**	**39327.4**	**1210.8**

	Activities										
	Other Fabricated Metal Products	Machinery & Equipment	Electrical Machinery & Apparatus	Communication, Medical and other Electronic Equipment	Manufacturing of Transport Equipment	Other Manufacturing & Recycling	Electricity	Water	Buildings & Construction	Trade	Accommodation
Total demand by activities	0	0	0	0	0	0	0	0	0	0	0
Total demand by commodities (own sector)	3832.2	14794.7	1743.5	1824.6	37016.5	1556.6	10305.2	3233.7	24093.4	61941.0	8355.6
Total income received from labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total income from government:											
National	0	0	0	0	0	0	0	0	0	0	0
Provincial	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0
Total investment from :											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total exports of goods and services to:											
South Africa	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0
Residual	0	0	0	0	0	0	0	0	0	0	0
Total income	**3832.2**	**14794.7**	**1743.5**	**1824.6**	**37016.5**	**1556.6**	**10305.2**	**3233.7**	**24093.4**	**61941.0**	**8355.6**

	Activities										
	Transport services - Rail	Transport services - Road	Transport services - Harbour	Transport services - Taxi's	Transport - Other	Communications	Insurance	Real estate	Business activities	General Government	Personal Services
Total demand by activities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total demand by commodities (own sector)	12021.7	10884.7	1909.1	737.6	17208.4	30705.3	26686.5	48773.2	12430.4	0.0	31271.7
Total income received from labour by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total factor income from capital	0	0	0	0	0	0	0	0	0	0	0
Total demand by enterprises	0	0	0	0	0	0	0	0	0	0	0
Total income received from household by race:											
Africans	0	0	0	0	0	0	0	0	0	0	0
Coloureds	0	0	0	0	0	0	0	0	0	0	0
Indians/Asians	0	0	0	0	0	0	0	0	0	0	0
Whites	0	0	0	0	0	0	0	0	0	0	0
Total income from government:											
National	0	0	0	0	0	0	0	0	0	0	0
Provincial	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0
Total investment from :											
Government	0	0	0	0	0	0	0	0	0	0	0
Corporate sector and households	0	0	0	0	0	0	0	0	0	0	0
Total exports of goods and services to:											
South Africa	0	0	0	0	0	0	0	0	0	0	0
ROW	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0
Residual	0	0	0	0	0	0	0	0	0	0	0
Total income	**12021.7**	**10884.7**	**1909.1**	**737.6**	**17208.4**	**30705.3**	**26686.5**	**48773.2**	**12430.4**	**0.0**	**31271.7**

APPENDIX C

Table 16: Leontief inverse multipliers derived from the KZN SAM

			Activities					Commodities				
			Basic Metal Products	Structural Metal Products	Other Fabricated Metal products	Machinery and Equipment	Manufacturing of Transport Equipment	Basic Metal Products	Structural Metal Products	Other Fabricated Metal products	Machinery and Equipment	Manufacturing of Transport Equipment
Activities	1	Sugar Cane Farming	0.000721	0.000760	0.000797	0.000707	0.000491	0.000609	0.000371	0.000386	0.000485	0.000374
	2	Livestock Farming	0.005933	0.006331	0.006370	0.005789	0.005339	0.005000	0.003077	0.003087	0.003961	0.003661
	3	Dairy Farming	0.001563	0.001653	0.001664	0.001515	0.001041	0.001323	0.000806	0.000810	0.001045	0.000808
	4	Forestry	0.001792	0.001791	0.002083	0.001755	0.001306	0.001594	0.000914	0.001049	0.001305	0.001161
	5	Other Agriculture products	0.015253	0.016148	0.016366	0.014803	0.010858	0.012901	0.007874	0.007957	0.010196	0.008182
	6	Coal Mining	0.011718	0.005569	0.005439	0.004952	0.001055	0.009002	0.002551	0.002460	0.002986	0.000721
	7	Other mining & quarrying products	0.050743	0.029733	0.023758	0.021386	0.004094	0.038883	0.013530	0.010693	0.012775	0.002672
	8	Meat, Fish, Fruit, Vegetables, Oils and Fat	0.030812	0.032877	0.033101	0.030091	0.020705	0.026040	0.016012	0.016081	0.020681	0.015912
	9	Dairy Products	0.003514	0.003721	0.003744	0.003417	0.002417	0.002999	0.001827	0.001836	0.002387	0.001912
	10	Grain Mill, Bakery and Animal Feed	0.010560	0.011233	0.011373	0.010316	0.007195	0.008961	0.005489	0.005544	0.007135	0.005586
	11	Other food products	0.004689	0.004961	0.004978	0.004539	0.003187	0.003982	0.002427	0.002431	0.003148	0.002484
	12	Beverages and tobacco products	0.008390	0.008934	0.008963	0.008178	0.005575	0.007102	0.004357	0.004363	0.005635	0.004324
	13	Textiles, Clothing, Leather Products and Footwear	0.028709	0.035637	0.039705	0.029083	0.069775	0.025143	0.017591	0.019384	0.020905	0.040283
	14	Wood and Wood Products	0.005210	0.005105	0.005344	0.004059	0.002829	0.004362	0.002486	0.002585	0.002839	0.002236
	15	Furniture	0.001089	0.001117	0.001079	0.001063	0.001063	0.001072	0.000616	0.000611	0.000922	0.001083
	16	Paper and Paper Products	0.022907	0.023426	0.029607	0.026253	0.020383	0.021486	0.012433	0.015330	0.020302	0.019302
	17	Publishing and Printing	0.003725	0.004137	0.003948	0.003622	0.003091	0.003486	0.002167	0.002105	0.002908	0.002983
	18	Petroleum	0.048234	0.029065	0.030151	0.029563	0.012639	0.038199	0.013814	0.014188	0.018947	0.009275
	19	Chemicals & Chemical Products (incl Plastic Products)	0.065506	0.068431	0.107292	0.076038	0.060151	0.056256	0.033839	0.051003	0.051844	0.042717
	20	Rubber Products	0.002667	0.003020	0.002683	0.002118	0.001488	0.002321	0.001499	0.001349	0.001575	0.001328
	21	Non-Metallic Mineral Products	0.004343	0.016752	0.004642	0.004991	0.004613	0.003741	0.007743	0.002295	0.003411	0.003111
	22	**Basic Metal Products**	**1.602947**	**0.640755**	**0.663017**	**0.597361**	**0.067663**	**1.220265**	**0.289387**	**0.294698**	**0.348745**	**0.038090**
	23	Structural Metal Products	0.001133	1.019722	0.001031	0.001972	0.002550	0.000997	0.458523	0.000530	0.001307	0.001507
	24	Other Fabricated Metal Products	0.015674	0.011823	1.017460	0.036047	0.004080	0.012204	0.005455	0.450060	0.021207	0.002604
	25	Machinery & Equipment	0.019325	0.021799	0.045829	1.109023	0.012938	0.015695	0.010276	0.020822	0.642347	0.008448
	26	Electrical Machinery & Apparatus	0.001505	0.001641	0.002342	0.008736	0.004666	0.001269	0.000797	0.001105	0.005207	0.002481
	27	Communication, Medical and other Electronic Equipment	0.000989	0.001099	0.001007	0.000957	0.000824	0.000897	0.000562	0.000525	0.000736	0.000733
	28	Manufacturing of Transport Equipment	0.047944	0.042543	0.043660	0.046167	1.588264	0.040077	0.020843	0.021311	0.031212	0.751499
	29	Other Manufacturing & Recycling	0.003836	0.003279	0.003110	0.003118	0.001607	0.003137	0.001580	0.001498	0.002075	0.001255
	30	Electricity	0.056849	0.038178	0.029631	0.026356	0.007192	0.044040	0.017567	0.013574	0.016305	0.005384
	31	Water	0.005765	0.006041	0.006009	0.005430	0.003630	0.004891	0.002956	0.002938	0.003774	0.002895
	32	Buildings & Construction	0.025751	0.023654	0.021412	0.020903	0.015641	0.022672	0.012082	0.011173	0.015989	0.014762
	33	Trade	0.135961	0.134118	0.138528	0.136954	0.239968	0.170308	0.091283	0.097977	0.164349	0.276402
	34	Accommodation	0.006452	0.006621	0.006616	0.006285	0.004583	0.005655	0.003330	0.003338	0.004568	0.003906
	35	Transport services - Rail	0.018363	0.013904	0.013642	0.012615	0.007495	0.016328	0.007480	0.007335	0.009612	0.006791
	36	Transport services - Road	0.017249	0.014113	0.013916	0.012841	0.007964	0.015348	0.007498	0.007383	0.009653	0.006974
	37	Transport services - Harbour	0.001994	0.001845	0.001837	0.001684	0.001129	0.001840	0.000998	0.000990	0.001287	0.000966
	38	Transport services - Taxi's	0.001384	0.001398	0.001400	0.001288	0.000892	0.001247	0.000727	0.000726	0.000948	0.000736
	39	Transport - Other	0.018987	0.016740	0.016401	0.015803	0.012913	0.018466	0.009557	0.009466	0.013390	0.012755
	40	Communications	0.050718	0.059005	0.050464	0.049827	0.046471	0.048859	0.031330	0.027976	0.041804	0.046568
	41	Insurance	0.049455	0.054023	0.052769	0.053046	0.031732	0.041935	0.026330	0.025728	0.036107	0.025143

	42	Real estate	0.095293	0.101205	0.093382	0.093591	0.064357	0.083151	0.050522	0.047193	0.067565	0.055672
	43	Business activities	0.028583	0.032457	0.029810	0.029327	0.020095	0.025940	0.016557	0.015499	0.022276	0.019571
	44	General Government	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	45	Personal Services	0.025044	0.023489	0.024605	0.021937	0.012171	0.020729	0.011364	0.011815	0.014772	0.009593
Commodities	1	Sugar Cane Farming	0.000848	0.000894	0.000937	0.000832	0.000577	0.000717	0.000436	0.000454	0.000571	0.000440
	2	Livestock Farming	0.007218	0.007702	0.007749	0.007043	0.006494	0.006082	0.003743	0.003755	0.004819	0.004454
	3	Dairy Farming	0.001796	0.001900	0.001912	0.001741	0.001197	0.001520	0.000927	0.000931	0.001201	0.000928
	4	Forestry	0.002082	0.002081	0.002421	0.002040	0.001519	0.001853	0.001063	0.001219	0.001517	0.001350
	5	Other Agriculture products	0.020004	0.021178	0.021464	0.019415	0.014241	0.016920	0.010327	0.010436	0.013373	0.010731
	6	Coal Mining	0.040147	0.019078	0.018634	0.016966	0.003615	0.030840	0.008741	0.008429	0.010228	0.002470
	7	Other mining & quarrying products	0.165815	0.097162	0.077636	0.069884	0.013378	0.127059	0.044214	0.034942	0.041745	0.008731
	8	Meat, Fish, Fruit, Vegetables, Oils and Fat	0.048573	0.051828	0.052181	0.047435	0.032639	0.041050	0.025242	0.025351	0.032602	0.025084
	9	Dairy Products	0.004208	0.004456	0.004483	0.004092	0.002894	0.003592	0.002188	0.002199	0.002859	0.002289
	10	Grain Mill, Bakery and Animal Feed	0.012431	0.013223	0.013387	0.012144	0.008470	0.010548	0.006462	0.006526	0.008399	0.006575
	11	Other food products	0.006643	0.007029	0.007053	0.006430	0.004516	0.005641	0.003438	0.003445	0.004460	0.003520
	12	Beverages and tobacco products	0.011002	0.011715	0.011754	0.010724	0.007311	0.009313	0.005714	0.005721	0.007389	0.005671
	13	Textiles, Clothing, Leather Products and Footwear	0.055496	0.068888	0.076751	0.056219	0.134879	0.048602	0.034005	0.037471	0.040411	0.077869
	14	Wood and Wood Products	0.007317	0.007169	0.007505	0.005700	0.003973	0.006127	0.003492	0.003631	0.003988	0.003140
	15	Furniture	0.001369	0.001403	0.001357	0.001336	0.001336	0.001347	0.000774	0.000769	0.001159	0.001361
	16	Paper and Paper Products	0.027455	0.028076	0.035484	0.031465	0.024430	0.025751	0.014901	0.018373	0.024333	0.023134
	17	Publishing and Printing	0.006382	0.007088	0.006764	0.006205	0.005296	0.005972	0.003712	0.003607	0.004983	0.005111
	18	Petroleum	0.084462	0.050894	0.052796	0.051767	0.022132	0.066889	0.024189	0.024845	0.033177	0.016241
	19	Chemicals & Chemical Products (incl Plastic Products)	0.092628	0.096764	0.151713	0.107519	0.085056	0.079547	0.047850	0.072120	0.073308	0.060403
	20	Rubber Products	0.004660	0.005277	0.004689	0.003701	0.002600	0.004057	0.002620	0.002357	0.002752	0.002321
	21	Non-Metallic Mineral Products	0.006459	0.024911	0.006902	0.007421	0.006859	0.005563	0.011513	0.003412	0.005071	0.004625
	22	**Basic Metal Products**	**0.793849**	**0.843628**	**0.872938**	**0.786495**	**0.089086**	**1.606619**	**0.381012**	**0.388003**	**0.459163**	**0.050150**
	23	Structural Metal Products	0.002521	0.043867	0.002293	0.004385	0.005672	0.002217	1.019864	0.001179	0.002907	0.003351
	24	Other Fabricated Metal Products	0.035448	0.026738	0.039487	0.081522	0.009228	0.027599	0.012337	1.017830	0.047960	0.005890
	25	Machinery & Equipment	0.033430	0.037711	0.079280	0.188603	0.022381	0.027151	0.017777	0.036020	1.111214	0.014615
	26	Electrical Machinery & Apparatus	0.008738	0.009532	0.013599	0.050729	0.027097	0.007371	0.004628	0.006416	0.030238	0.014405
	27	Communication, Medical and other Electronic Equipment	0.004675	0.005191	0.004757	0.004523	0.003895	0.004237	0.002653	0.002480	0.003476	0.003462
	28	Manufacturing of Transport Equipment	0.102487	0.090942	0.093329	0.098689	1.257501	0.085669	0.044555	0.045556	0.066720	1.606440
	29	Other Manufacturing & Recycling	0.008247	0.007049	0.006687	0.006704	0.003455	0.006745	0.003397	0.003220	0.004460	0.002698
	30	Electricity	0.082614	0.055481	0.043060	0.038302	0.010452	0.063999	0.025529	0.019726	0.023695	0.007824
	31	Water	0.006722	0.007044	0.007007	0.006332	0.004233	0.005704	0.003447	0.003426	0.004401	0.003375
	32	Buildings & Construction	0.029499	0.027097	0.024528	0.023946	0.017918	0.025972	0.013841	0.012799	0.018317	0.016911
	33	Trade	0.043811	0.043217	0.044638	0.044130	0.077325	0.054878	0.029414	0.031571	0.052958	0.089065
	34	Accommodation	0.008718	0.008947	0.008940	0.008493	0.006192	0.007641	0.004499	0.004511	0.006173	0.005278
	35	Transport services - Rail	0.024009	0.018180	0.017836	0.016494	0.009800	0.021348	0.009781	0.009591	0.012568	0.008879
	36	Transport services - Road	0.023130	0.018925	0.018660	0.017219	0.010679	0.020581	0.010054	0.009901	0.012945	0.009352
	37	Transport services - Harbour	0.002892	0.002675	0.002664	0.002442	0.001637	0.002668	0.001447	0.001436	0.001867	0.001401
	38	Transport services - Taxi's	0.001793	0.001811	0.001814	0.001668	0.001155	0.001615	0.000941	0.000940	0.001228	0.000954
	39	Transport - Other	0.026543	0.023401	0.022926	0.022091	0.018051	0.025813	0.013360	0.013233	0.018718	0.017830
	40	Communications	0.059562	0.069294	0.059264	0.058516	0.054574	0.057379	0.036793	0.032855	0.049094	0.054689
	41	Insurance	0.059292	0.064768	0.063265	0.063597	0.038043	0.050276	0.031567	0.030846	0.043289	0.030144
	42	Real estate	0.120485	0.127960	0.118068	0.118334	0.081371	0.105133	0.063878	0.059669	0.085427	0.070390
	43	Business activities	0.044548	0.050586	0.046461	0.045708	0.031320	0.040429	0.025805	0.024156	0.034718	0.030503
	44	General Government	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	45	Personal Services	0.031172	0.029236	0.030625	0.027304	0.015149	0.025801	0.014144	0.014706	0.018386	0.011940
Factor Payments - Labour	1	Africans - Legislators, senior officials and managers	0.018480	0.019894	0.019936	0.018085	0.012892	0.015834	0.009782	0.009800	0.012698	0.010286
	2	Africans - Professionals	0.026969	0.028538	0.028564	0.025957	0.018788	0.023248	0.014119	0.014145	0.018456	0.015336

	3	Africans - Technical & associate professionals	0.010265	0.011153	0.011199	0.010124	0.006961	0.008688	0.005430	0.005440	0.006966	0.005369
	4	Africans - Clerks	0.010203	0.010980	0.011001	0.010001	0.007293	0.008805	0.005428	0.005443	0.007102	0.005921
	5	Africans - Service workers, shop & market sales workers	0.017195	0.018414	0.018312	0.016832	0.012265	0.014913	0.009142	0.009112	0.012047	0.010141
	6	Africans - Skilled agric. and fishery workers	0.009781	0.010557	0.010603	0.009577	0.006756	0.008327	0.005165	0.005180	0.006658	0.005290
	7	Africans - Craft and related traders workers	0.026542	0.029190	0.029443	0.026415	0.017586	0.022159	0.014056	0.014114	0.017767	0.012969
	8	Africans - Plant and machine operators & assemblers	0.021912	0.024144	0.024317	0.021828	0.014326	0.018244	0.011604	0.011630	0.014606	0.010453
	9	Africans - Elementary occupations	0.030706	0.032903	0.032971	0.029892	0.021729	0.026429	0.016241	0.016281	0.021164	0.017542
	10	Africans - Domestic workers	0.027689	0.029282	0.029242	0.026599	0.019901	0.024070	0.014581	0.014595	0.019174	0.016522
	11	Africans - Occupation unspecified	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	12	Coloureds - Legislators, senior officials and managers	0.002464	0.002712	0.002722	0.002464	0.001625	0.002063	0.001309	0.001308	0.001663	0.001212
	13	Coloureds - Professionals	0.001404	0.001521	0.001527	0.001388	0.000952	0.001193	0.000743	0.000744	0.000960	0.000744
	14	Coloureds - Technical & associate professionals	0.000933	0.001037	0.001042	0.000942	0.000605	0.000774	0.000497	0.000497	0.000626	0.000438
	15	Coloureds - Clerks	0.000811	0.000896	0.000901	0.000816	0.000549	0.000683	0.000434	0.000435	0.000555	0.000415
	16	Coloureds - Service workers, shop & market sales workers	0.000405	0.000445	0.000446	0.000406	0.000278	0.000343	0.000217	0.000217	0.000279	0.000214
	17	Coloureds - Skilled agric. and fishery workers	0.000039	0.000040	0.000039	0.000036	0.000028	0.000034	0.000020	0.000020	0.000027	0.000024
	18	Coloureds - Craft and related traders workers	0.001805	0.002041	0.002073	0.001845	0.001133	0.001466	0.000962	0.000969	0.001185	0.000755
	19	Coloureds - Plant and machine operators & assemblers	0.000554	0.000624	0.000632	0.000563	0.000345	0.000451	0.000295	0.000296	0.000363	0.000231
	20	Coloureds - Elementary occupations	0.000097	0.000104	0.000105	0.000095	0.000073	0.000085	0.000052	0.000052	0.000069	0.000060
	21	Coloureds - Domestic workers	0.000749	0.000806	0.000807	0.000733	0.000517	0.000640	0.000396	0.000396	0.000513	0.000411
	22	Coloureds - Occupation unspecified	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	23	Asians/Indians - Legislators, senior officials and managers	0.012888	0.014316	0.014434	0.012997	0.008550	0.010748	0.006883	0.006908	0.008710	0.006268
	24	Asians/Indians - Professionals	0.011012	0.011997	0.012014	0.010922	0.007326	0.009289	0.005825	0.005819	0.007468	0.005616
	25	Asians/Indians - Technical & associate professionals	0.007107	0.007902	0.007960	0.007168	0.004609	0.005891	0.003783	0.003789	0.004758	0.003318
	26	Asians/Indians - Clerks	0.007320	0.008117	0.008173	0.007378	0.004892	0.006126	0.003913	0.003924	0.004971	0.003628
	27	Asians/Indians - Service workers, shop & market sales workers	0.004047	0.004455	0.004488	0.004060	0.002814	0.003433	0.002170	0.002181	0.002796	0.002171
	28	Asians/Indians - Skilled agric. and fishery workers	0.000332	0.000374	0.000380	0.000337	0.000203	0.000268	0.000175	0.000177	0.000214	0.000132
	29	Asians/Indians - Craft and related traders workers	0.006570	0.007423	0.007530	0.006710	0.004130	0.005344	0.003503	0.003524	0.004320	0.002768
	30	Asians/Indians - Plant and machine operators & assemblers	0.008065	0.009108	0.009224	0.008224	0.005004	0.006548	0.004293	0.004310	0.005277	0.003325
	31	Asians/Indians - Elementary occupations	0.002103	0.002348	0.002378	0.002128	0.001390	0.001744	0.001124	0.001132	0.001413	0.000998
	32	Asians/Indians - Domestic workers	0.006246	0.006744	0.006758	0.006127	0.004332	0.005335	0.003308	0.003312	0.004280	0.003428
	33	Asians/Indians - Occupation unspecified	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	34	Whites - Legislators, senior officials and managers	0.019847	0.022204	0.022355	0.020186	0.012916	0.016442	0.010621	0.010634	0.013374	0.009273
	35	Whites - Professionals	0.012735	0.014119	0.014204	0.012837	0.008124	0.010539	0.006753	0.006755	0.008499	0.005841
	36	Whites - Technical & associate professionals	0.007219	0.008002	0.007981	0.007300	0.004688	0.006029	0.003852	0.003828	0.004900	0.003481
	37	Whites - Clerks	0.004438	0.004928	0.004931	0.004485	0.002874	0.003695	0.002367	0.002358	0.002996	0.002106
	38	Whites - Service workers, shop & market sales workers	0.002040	0.002265	0.002283	0.002064	0.001363	0.001707	0.001092	0.001096	0.001391	0.001012
	39	Whites - Skilled agric. and fishery workers	0.000907	0.001007	0.001021	0.000913	0.000601	0.000753	0.000482	0.000486	0.000607	0.000432
	40	Whites - Craft and related traders workers	0.004428	0.005041	0.005120	0.004549	0.002696	0.003558	0.002358	0.002371	0.002873	0.001721
	41	Whites - Plant and machine operators & assemblers	0.001575	0.001791	0.001815	0.001616	0.000971	0.001274	0.000842	0.000845	0.001029	0.000632
	42	Whites - Elementary occupations	0.001354	0.001524	0.001545	0.001379	0.000867	0.001109	0.000722	0.000727	0.000897	0.000595
	43	Whites - Domestic workers	0.003918	0.004303	0.004326	0.003897	0.002569	0.003272	0.002073	0.002075	0.002621	0.001898
	44	Whites - Occupation Unspecified	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Factor Payments - Capital	1	Capital (GOS) Public Enterprise	0.129239	0.085271	0.085851	0.099537	0.040456	0.103060	0.040638	0.040645	0.063568	0.030216
	2	Capital (GOS) Private Business Enterprise	0.287782	0.365034	0.362855	0.307961	0.231451	0.247833	0.177752	0.176470	0.214561	0.177630
	3	Capital (GOS) Combi-Taxi Enterprise	0.004570	0.003837	0.003792	0.003494	0.002193	0.004049	0.002020	0.001993	0.002602	0.001894
	4	Capital (GOS) Informal Enterprise	0.007164	0.007599	0.007687	0.006962	0.005431	0.006053	0.003702	0.003735	0.004787	0.003985
Enterprises	1	Public Enterprise	0.072242	0.047665	0.047989	0.055640	0.022614	0.057609	0.022716	0.022720	0.035534	0.016890
	2	Private Business Enterprise	0.098480	0.124916	0.124171	0.105386	0.079204	0.084809	0.060828	0.060389	0.073424	0.060786
	3	Combi-Taxi Enterprise	0.001564	0.001313	0.001298	0.001196	0.000751	0.001386	0.000691	0.000682	0.000890	0.000648

	4	Informal Enterprise	0.002451	0.002600	0.002631	0.002382	0.001858	0.002072	0.001267	0.001278	0.001638	0.001364
Households	1	Blacks - P1	0.000654	0.000691	0.000690	0.000628	0.000468	0.000568	0.000344	0.000344	0.000452	0.000388
	2	Blacks - P2	0.001651	0.001775	0.001781	0.001614	0.001139	0.001408	0.000870	0.000872	0.001125	0.000898
	3	Blacks - P3	0.004038	0.004333	0.004347	0.003943	0.002771	0.003440	0.002122	0.002127	0.002745	0.002181
	4	Blacks - P4	0.005196	0.005553	0.005569	0.005062	0.003540	0.004423	0.002719	0.002724	0.003521	0.002785
	5	Blacks - P5	0.006472	0.006907	0.006927	0.006302	0.004376	0.005499	0.003377	0.003383	0.004371	0.003428
	6	Blacks - P6	0.008348	0.008882	0.008907	0.008114	0.005595	0.007081	0.004339	0.004344	0.005615	0.004369
	7	Blacks - P7	0.019664	0.021151	0.021222	0.019245	0.013328	0.016683	0.010324	0.010341	0.013304	0.010368
	8	Blacks - P8	0.022644	0.024137	0.024208	0.022040	0.015248	0.019226	0.011797	0.011814	0.015269	0.011928
	9	Blacks - P9	0.028863	0.030822	0.030902	0.028118	0.019470	0.024515	0.015067	0.015084	0.019488	0.015240
	10	Blacks - P10	0.044130	0.046651	0.046678	0.042666	0.029493	0.037521	0.022842	0.022832	0.029654	0.023250
	11	Blacks - P11	0.031433	0.032760	0.032768	0.030118	0.020743	0.026741	0.016066	0.016060	0.020983	0.016473
	12	Blacks - P12	0.043569	0.045732	0.045737	0.041873	0.029340	0.037225	0.022489	0.022488	0.029358	0.023490
	13	Coloureds - P1	0.000017	0.000019	0.000019	0.000017	0.000012	0.000015	0.000009	0.000009	0.000012	0.000010
	14	Coloureds - P2	0.000008	0.000008	0.000009	0.000008	0.000005	0.000006	0.000004	0.000004	0.000005	0.000004
	15	Coloureds - P3	0.000039	0.000043	0.000043	0.000039	0.000025	0.000032	0.000020	0.000021	0.000026	0.000018
	16	Coloureds - P4	0.000050	0.000054	0.000054	0.000049	0.000032	0.000041	0.000026	0.000026	0.000033	0.000024
	17	Coloureds - P5	0.000124	0.000138	0.000139	0.000125	0.000080	0.000103	0.000066	0.000066	0.000083	0.000057
	18	Coloureds - P6	0.000132	0.000145	0.000146	0.000131	0.000086	0.000110	0.000070	0.000070	0.000088	0.000063
	19	Coloureds - P7	0.000179	0.000191	0.000193	0.000176	0.000110	0.000148	0.000091	0.000092	0.000116	0.000079
	20	Coloureds - P8	0.000341	0.000371	0.000373	0.000339	0.000218	0.000283	0.000178	0.000178	0.000226	0.000159
	21	Coloureds - P9	0.000769	0.000841	0.000847	0.000766	0.000491	0.000637	0.000403	0.000403	0.000509	0.000354
	22	Coloureds - P10	0.001834	0.002001	0.002009	0.001819	0.001189	0.001531	0.000964	0.000964	0.001223	0.000881
	23	Coloureds - P11	0.002324	0.002445	0.002457	0.002262	0.001439	0.001932	0.001177	0.001178	0.001515	0.001067
	24	Coloureds - P12	0.005133	0.005550	0.005568	0.005067	0.003348	0.004306	0.002685	0.002685	0.003437	0.002528
	25	Asians/Indians - P1	0.000008	0.000009	0.000009	0.000008	0.000006	0.000007	0.000004	0.000004	0.000006	0.000004
	26	Asians/Indians - P2	0.000047	0.000053	0.000054	0.000048	0.000030	0.000039	0.000025	0.000025	0.000031	0.000021
	27	Asians/Indians - P3	0.000071	0.000078	0.000078	0.000071	0.000045	0.000059	0.000037	0.000037	0.000047	0.000033
	28	Asians/Indians - P4	0.000092	0.000101	0.000101	0.000092	0.000059	0.000077	0.000048	0.000048	0.000061	0.000043
	29	Asians/Indians - P5	0.000188	0.000205	0.000206	0.000187	0.000122	0.000157	0.000099	0.000099	0.000126	0.000091
	30	Asians/Indians - P6	0.000439	0.000480	0.000483	0.000437	0.000283	0.000365	0.000230	0.000231	0.000292	0.000207
	31	Asians/Indians - P7	0.002207	0.002425	0.002445	0.002207	0.001415	0.001828	0.001161	0.001164	0.001464	0.001018
	32	Asians/Indians - P8	0.003117	0.003422	0.003450	0.003116	0.002021	0.002591	0.001643	0.001647	0.002079	0.001471
	33	Asians/Indians - P9	0.005907	0.006503	0.006556	0.005913	0.003811	0.004897	0.003115	0.003124	0.003931	0.002753
	34	Asians/Indians - P10	0.013538	0.014694	0.014789	0.013419	0.008631	0.011241	0.007054	0.007065	0.008951	0.006297
	35	Asians/Indians - P11	0.015487	0.016599	0.016668	0.015205	0.009855	0.012914	0.008000	0.008001	0.010222	0.007320
	36	Asians/Indians - P12	0.037617	0.040402	0.040549	0.036982	0.024236	0.031476	0.019521	0.019521	0.024995	0.018184
	37	Whites - P1	0.000004	0.000004	0.000004	0.000004	0.000003	0.000003	0.000002	0.000002	0.000003	0.000002
	38	Whites - P2	0.000016	0.000017	0.000018	0.000016	0.000010	0.000013	0.000008	0.000008	0.000010	0.000007
	39	Whites - P3	0.000011	0.000012	0.000012	0.000011	0.000006	0.000009	0.000006	0.000006	0.000007	0.000004
	40	Whites - P4	0.000112	0.000122	0.000123	0.000111	0.000070	0.000092	0.000058	0.000058	0.000073	0.000050
	41	Whites - P5	0.000151	0.000162	0.000163	0.000149	0.000095	0.000125	0.000078	0.000078	0.000099	0.000070
	42	Whites - P6	0.000275	0.000298	0.000299	0.000273	0.000174	0.000229	0.000143	0.000143	0.000182	0.000128
	43	Whites - P7	0.000762	0.000822	0.000825	0.000752	0.000478	0.000632	0.000394	0.000394	0.000501	0.000350
	44	Whites - P8	0.000580	0.000632	0.000635	0.000577	0.000366	0.000480	0.000303	0.000303	0.000383	0.000265
	45	Whites - P9	0.001746	0.001885	0.001892	0.001726	0.001096	0.001448	0.000904	0.000903	0.001150	0.000800
	46	Whites - P10	0.004937	0.005230	0.005246	0.004821	0.003028	0.004089	0.002510	0.002506	0.003210	0.002216
	47	Whites - P11	0.010389	0.010945	0.010966	0.010104	0.006372	0.008625	0.005263	0.005251	0.006754	0.004709
	48	Whites - P12	0.073059	0.078892	0.079067	0.072146	0.046249	0.060789	0.037943	0.037864	0.048304	0.034126

Government	1	National government	0.160879	0.165704	0.169764	0.162981	0.142685	0.146672	0.105641	0.108299	0.129515	0.129845
	2	Provincial government	0.001048	0.000985	0.000945	0.000956	0.000818	0.000988	0.000532	0.000523	0.000792	0.000838
	3	Local government	0.016548	0.017508	0.017371	0.016146	0.010991	0.014132	0.008601	0.008537	0.011279	0.008824
Capital account	1	Government	0.013818	0.009117	0.009179	0.010643	0.004326	0.011019	0.004345	0.004346	0.006797	0.003231
	2	Corporate sector & households	0.108225	0.133817	0.133079	0.113957	0.084581	0.092966	0.065191	0.064742	0.079269	0.064902
Rest of SA			0.375510	0.392537	0.380101	0.383367	0.298037	0.403622	0.591288	0.461659	0.265228	0.267320
Rest of the World			0.316797	0.273086	0.282331	0.305192	0.454275	0.324612	0.220892	0.348403	0.502542	0.521768

Table 17: Summary of Leontief Inverse Multipliers derived from the KZN SAM

	Activities					Commodities				
	Basic Metal Products	Structural Metal Products	Other Fabricated Metal Products	Machinery and Equipment	Manufacturing of Transport Equipment	Basic Metal Products	Structural Metal Products	Other Fabricated Metal Products	Machinery and Equipment	Manufacturing of Transport Equipment
GDP Multipliers	2.5593	2.5799	2.6210	2.5755	2.3981	2.0904	1.2284	1.2392	1.6706	1.4648
Commodity Multipliers	2.1308	2.0940	1.8308	2.1612	2.1863	2.7758	2.0263	2.0401	2.4283	2.3260
Factor payments to labour multipliers	**0.3643**	**0.3925**	**0.3954**	**0.3572**	**0.2407**	**0.3074**	**0.1908**	**0.1916**	**0.2447**	**0.1849**
Labour multipliers by race:										
Africans	0.1997	0.2151	0.2156	0.1953	0.1385	0.1707	0.1055	0.1057	0.1366	0.1098
Coloureds	0.0093	0.0102	0.0103	0.0093	0.0061	0.0077	0.0049	0.0049	0.0062	0.0045
Asians/Indians	0.0657	0.0728	0.0733	0.0661	0.0432	0.0547	0.0350	0.0351	0.0442	0.0317
Whites	0.0585	0.0652	0.0656	0.0592	0.0377	0.0484	0.0312	0.0312	0.0392	0.0270
Factor payments to capital multipliers	**0.4288**	**0.4617**	**0.4602**	**0.4180**	**0.2795**	**0.3610**	**0.2241**	**0.2228**	**0.2855**	**0.2137**
Skill level multipliers:										
Legislators, senior officials and managers	0.0537	0.0591	0.0594	0.0537	0.0360	0.0451	0.0286	0.0286	0.0364	0.0270
Professionals	0.0521	0.0562	0.0563	0.0511	0.0352	0.0443	0.0274	0.0275	0.0354	0.0275
Technical & associate professionals	0.0255	0.0281	0.0282	0.0255	0.0169	0.0214	0.0136	0.0136	0.0172	0.0126
Clerks	0.0228	0.0249	0.0250	0.0227	0.0156	0.0193	0.0121	0.0122	0.0156	0.0121
Service workers, shop & market sales workers	0.0237	0.0256	0.0255	0.0234	0.0167	0.0204	0.0126	0.0126	0.0165	0.0135
Skilled agric. and fishery workers	0.0111	0.0120	0.0120	0.0109	0.0076	0.0094	0.0058	0.0059	0.0075	0.0059
Craft and related traders workers	0.0393	0.0437	0.0442	0.0395	0.0255	0.0325	0.0209	0.0210	0.0261	0.0182
Plant and machine operators & assemblers	0.0321	0.0357	0.0360	0.0322	0.0206	0.0265	0.0170	0.0171	0.0213	0.0146
Elementary occupations	0.0343	0.0369	0.0370	0.0335	0.0241	0.0294	0.0181	0.0182	0.0235	0.0192
Domestic workers	0.0386	0.0411	0.0411	0.0374	0.0273	0.0333	0.0204	0.0204	0.0266	0.0223
Tax multipliers	0.1785	0.1842	0.1881	0.1801	0.1545	0.1618	0.1148	0.1174	0.1416	0.1395
Import multipliers	0.3168	0.2731	0.2823	0.3052	0.4543	0.3246	0.2209	0.3484	0.5025	0.5218